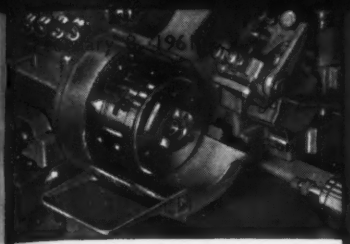
MACHINERY

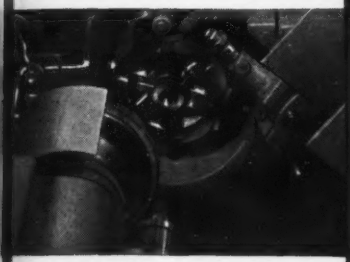
FEBRUARY 8, 1961 — ONE SHILLING & THREEPENCE

APSTAN LATHES AND COMBINATION TURRET LATHE

Photograph by courtesy Holman Bros. Ltd. Cambo



Heald 171 Size-Matic Internal grinds I.D.'s of two different size gyro rotor assemblies AS WELL AS two different I.D.'s in a rotor support frame.



Combination set-up on a 171 Gage-Matic with a slide bar facing attachment for SIMULTANEOUS bore and face grinding of cam seam rollers.

Slide bar boring attachment on a Heald 171 Size-Matic Internal ensures CONCENTRICITY between ground stator bore and housing diameters of stator and housing assembly within 0.00005in.

NEW

HEALD

Model 171

Internal Grinding Machine

now being built in Birmingham

This latest addition to the range of British Built Heald Internal Grinding & Boring Machines can bring you greater return on investment. Available in Size-Matic or Gage-Matic styles, the Heald Model 171 is a precision internal grinder for high volume production with completely automatic grinding cycles.

Send now for Catalogue No. 2-171-2E for complete information.

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Sales Representative **ALFRED HERBERT LIMITED · COVENTRY**

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Toolbits are subjected to a specialised heat treatment to ensure extra life and durability They satisfy the needs of users who require maximum performance at no extra cost. These qualities ensure that a change to "Super Capital" is a change for the best. Available in Sheffield and also from branch office stocks in London, Birmingham, Manchester and Cardiff.

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The majority of leading British Machine Tool Manufacturers specify VICKERS Hydraulic Systems.

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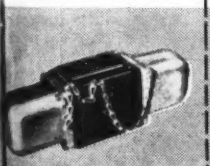
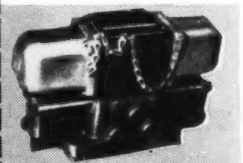


Solenoid operated 2 & 4-way Valve



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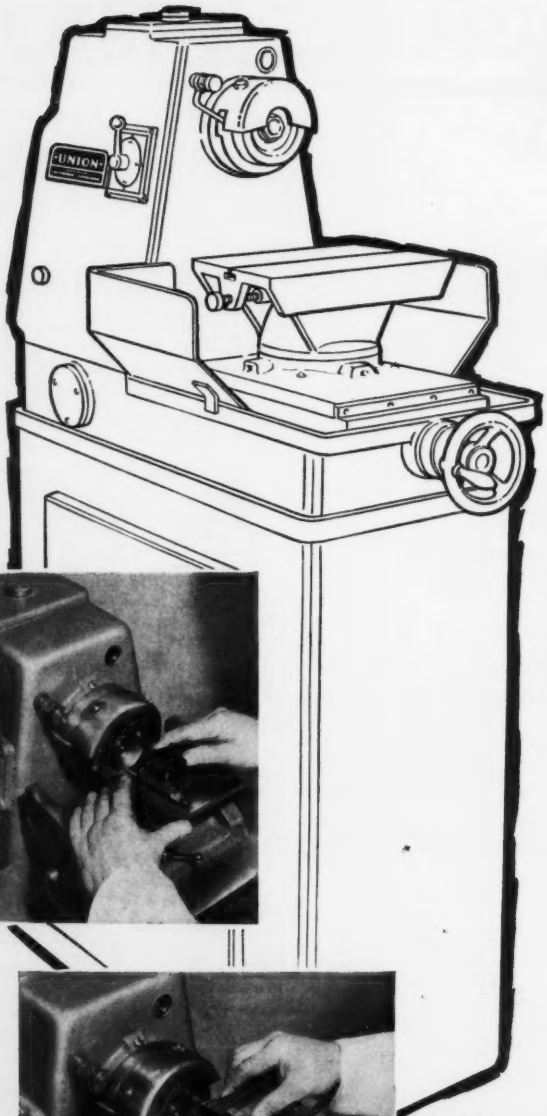

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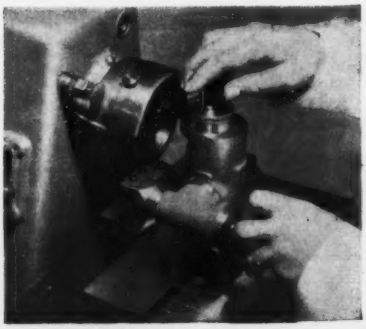
LAPPING AND CHIPBREAKER GRINDING MACHINE

Lapping carbide tools after grinding improves performance, prolongs re-grinding intervals and gives a superior finish to the turned part.

BRIEF SPECIFICATION:

4,800 r.p.m. spindle on opposed Timken bearings.
Lapping speed 5,000 surface f.p.m.
In-built coolant pump and tank.
Fully adjustable table on ball bearing slideways.
Supplied as bench or cabinet model



above left
Table can be inclined either way up to 20°. Tool guide moves 90° with accurately graduated base.

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Quick, accurate setting.

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Vertical feed with adjustable micrometer dials.

Literature available covers the Harrison range of Lathes from 9" to 17" swing: Milling, Drilling and Grinding Machines and Engineers Accessories.

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This is the mighty planet Jupiter swinging majestically round the Sun at a distance five times that of the Earth. The artist has set you down on Europa, one of its retinue of satellites, and you look out over the eerie, alien, scenery towards the giant belted globe of Jupiter 415,000 miles distant, glowering against an almost black canopy of eternal night.

According to modern atomic theory, at extremely high pressure atoms can become crushed and matter can collapse in upon itself. Even the entire Earth is far too light to achieve this pressure but at the centre of Jupiter, which is 317 times heavier than the Earth, this pressure is almost reached. If Jupiter was any bigger the matter at its centre would literally buckle and the planet would contract. For this reason when you see Jupiter you can fairly claim to be looking at the 'largest stone in the Universe.'

Yet even Jupiter is part of man's eventual heritage and we, at Balfours, are preparing the basic means of Production, the High Speed Steel and Alloy Tool Steels, Reamers, Cutters, Twist Drills and other Engineers Tools that will one day make it possible for space vehicles to travel to these remote regions.

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ASSOCIATED COMPANY: THE EAGLE & GLOBE STEEL CO, LTD.

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Suitable for jig boring, grinding, milling and shaping machines. Movements are fully indexed through 360° in the horizontal plane and 90° in the vertical. Any combination of angles can be obtained.

Available with 4" and 6" jaw widths. Accurately indexed for angular work with spot sight and knife edge for register. Note the clean design, low height and rigid mounting. Angles cannot alter once the clamps have been locked.

Universal table fitted with interchangeable table. Changeover from circular to rectangular table is readily effected by loosening clamping bolts.
Available in two sizes. Circular 6" and 8" diameter. Rectangular 8" x 6" and 10" x 8".

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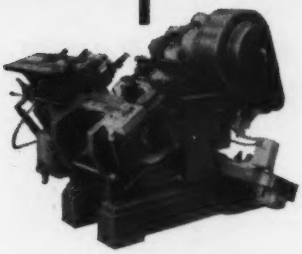

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STRIP FEED PRESSES
... for high speed production of can ends and similar stampings up to 600 per minute.

HYDRAULIC EXTRUSION PRESSES
... for cold extrusion of steel ... in capacities ranging from 300 tons to 1000 tons.

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... single action or double open rod construction or closed, 50 tons capacity to 3,000 or even more, standar design or special high speed models, electronic controls

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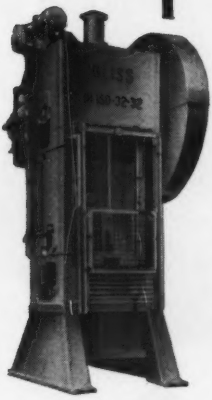

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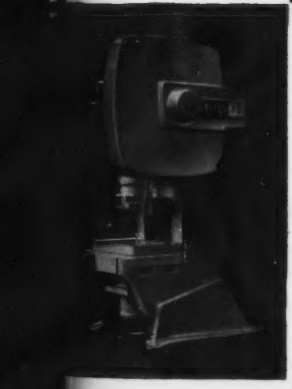

INCLINABLE PRESSES
... in bench, single or double crank design. With air friction or mechanical clutches and whatever you need in cushions and feeds.

Bliss makes more types and sizes of presses than any other builder. No matter how big or complex your next metal stamping job may be, do not hesitate to call on the technical advice of Bliss.

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There's talk of Sykes in the control room

In this Space Age the need for fine pitch gears grows steadily — for missile guidance systems, rocket fuel pump drives, navigational aids, and a host of other applications. The design engineer nowadays is thus faced with many intricate problems — not only must gears for this type of work possess the highest degree of precision and reliability, but they must also often withstand very heavy tooth loadings, tremendous acceleration and extreme temperatures.

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Sykes have carried out immense research and development in these fields and are probably better placed than anyone else to advise on fine pitch gear generating and shaving on a production basis. In fact, Sykes are one of the few companies in the world offering tools for these purposes in the finest range, i.e. over 100 D.P.

With its unrivalled background of experience and knowledge, Sykes Technical Advisory Service has solved many customers' problems. Maybe a combination of Sykes gear generators and shaving machines could help you out of a difficulty. Anyway, if you would like an opinion . . .

Talk to SYKES about gear production

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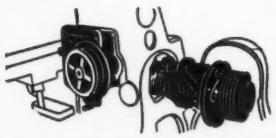
A&S MODEL 2 AGU

UNIVERSAL MILLING MACHINE

This machine represents outstanding value in universal millers, especially when you consider the high quality built into it. Ideal for tool-room use or short production runs. Unbeatable for consistent precision output with absolute minimum of maintenance or trouble. Only by omitting all unnecessary features can we produce this fine, heavily-built machine so inexpensively.



UNIT CONSTRUCTION—Maintenance is much simplified by the provision of self-contained units for the speed change mechanism and the spindle gear-box. These are flange mounted and easily withdrawn for servicing.

TABLE

Working surface 40" x 10"
Traverses—23" longitudinally—
7½" transversely—14½" vertically
Angular displacement of table—
47 degrees either side

MOTOR

Choice of single speed or two-speed 4 or 4/5 H.P.

SPEED SELECTION

Easily read dial system for rapid selection of spindle speeds:
Range A: 12 speeds from 30-600 r.p.m.
Range B: 12 speeds from 60-1200 r.p.m.
Range C: 24 speeds from 30-1200 r.p.m. (using 2-speed motor)

FEED SELECTION

Selection and engagement by two levers. 9 feed rates, from ¼" to 10" per min., or with 2-speed motor, 12 feed rates from ¼" to 20" per min.

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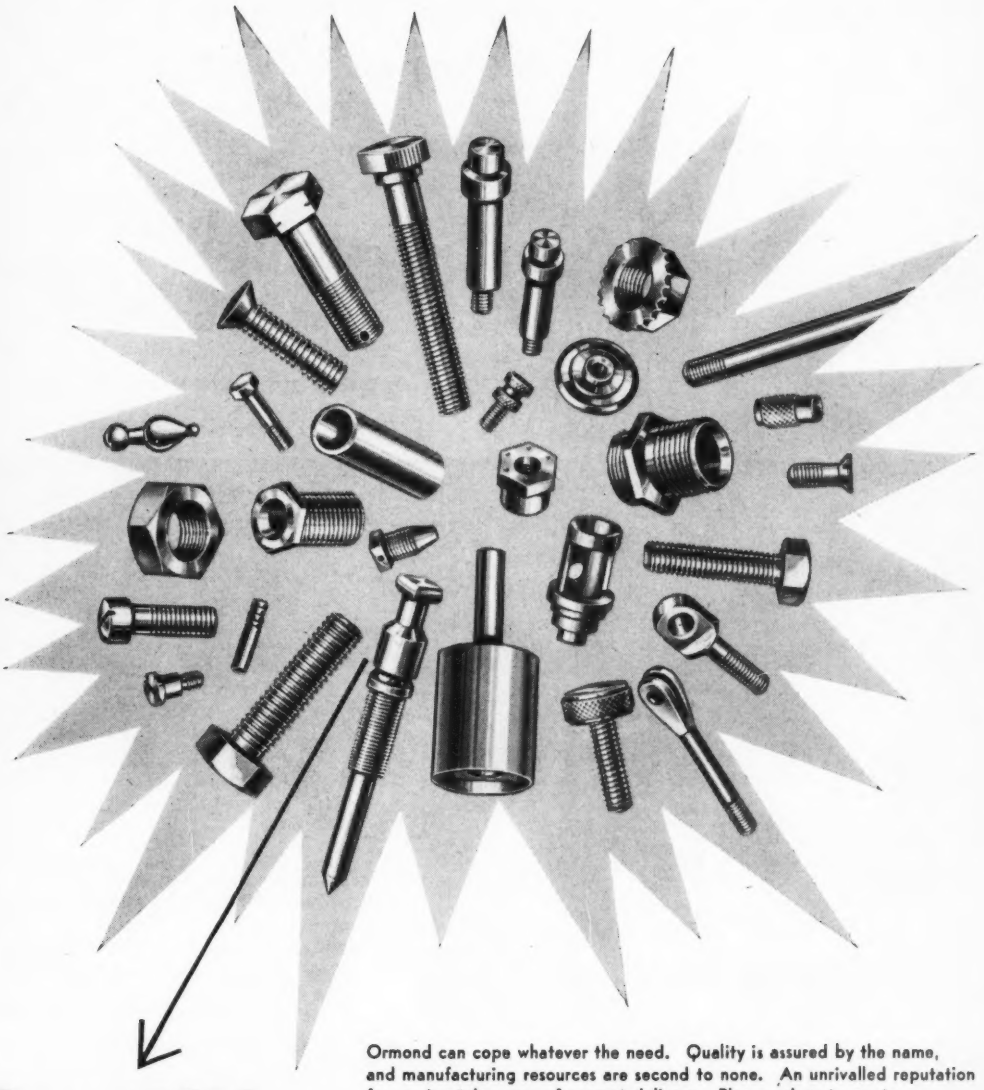
Built up to a standard - not down to a price



Repetition work

Ormond can cope whatever the need. Quality is assured by the name, and manufacturing resources are second to none. An unrivalled reputation for service takes care of prompt delivery. Please ask us to quote. Any quantity.

The Repetition Parts range covers single and multi spindle automatics up to 1¼" dia., Brass, Steel and Light Alloy Screws in Rolled and Cut Threads, Grubscrews, Nuts, Allthreads, Hexagon Bolts and Setscrews turned from bar and Cold Headed Grades "A", "B", and High Tensile.

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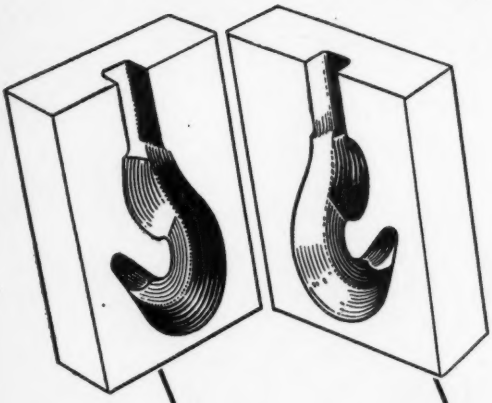
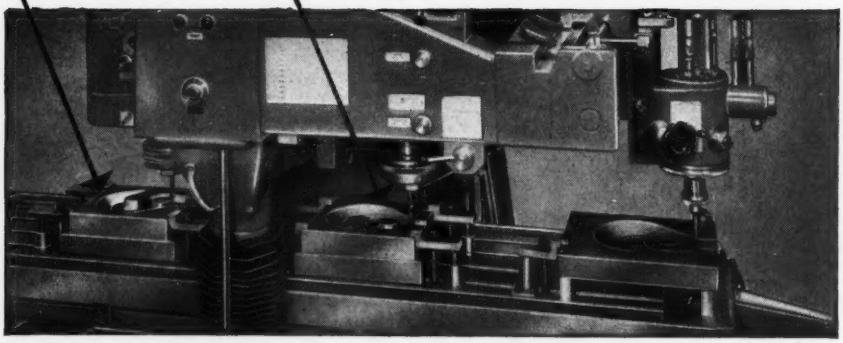


Both halves at once



SWISS RIGID *AUTOMATIC* HYDROCOPYING DIE-SINKING MACHINE KA 200

Reverse image attachment copy mills both left- and right-hand die halves at the same time from the same model. Copying is accurate to within .002", fully automatic and needs no supervision. 360° profiles can be produced without using a rotating table and feed is constant—*and* on vertical contours up to 90°. Light feeler pressure permits the use of wooden or plaster models.

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A two spindle machine with reverse image attachment is available for immediate delivery.

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the PG LTD OPTIDRESS

for wheelforming under optical control without template

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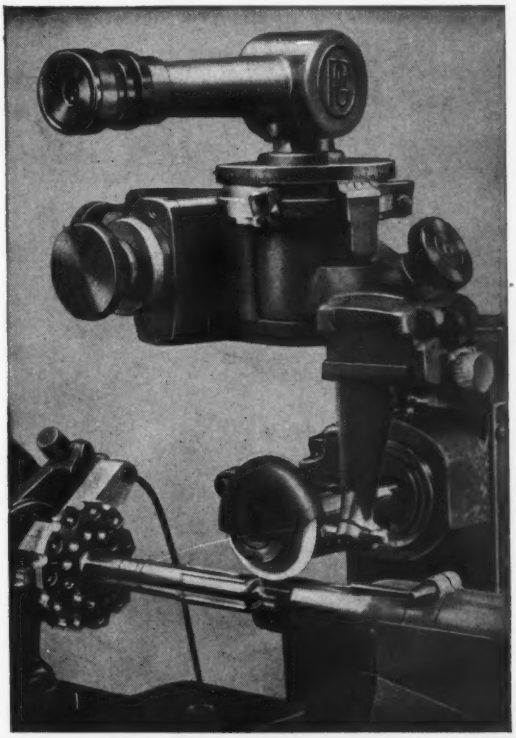
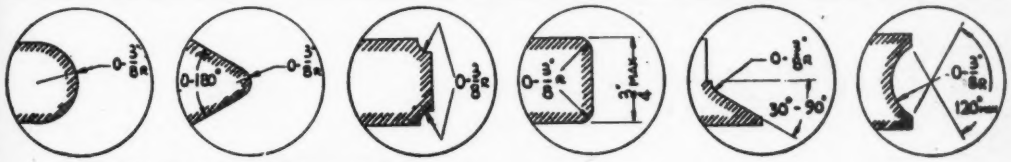


Patent Pending on No. 36115/58



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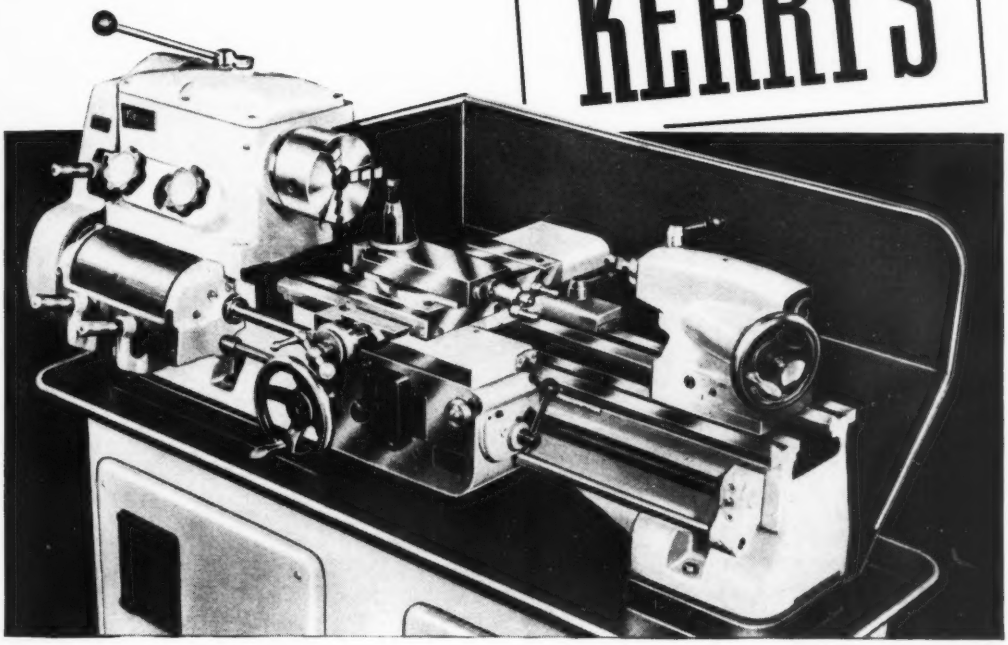

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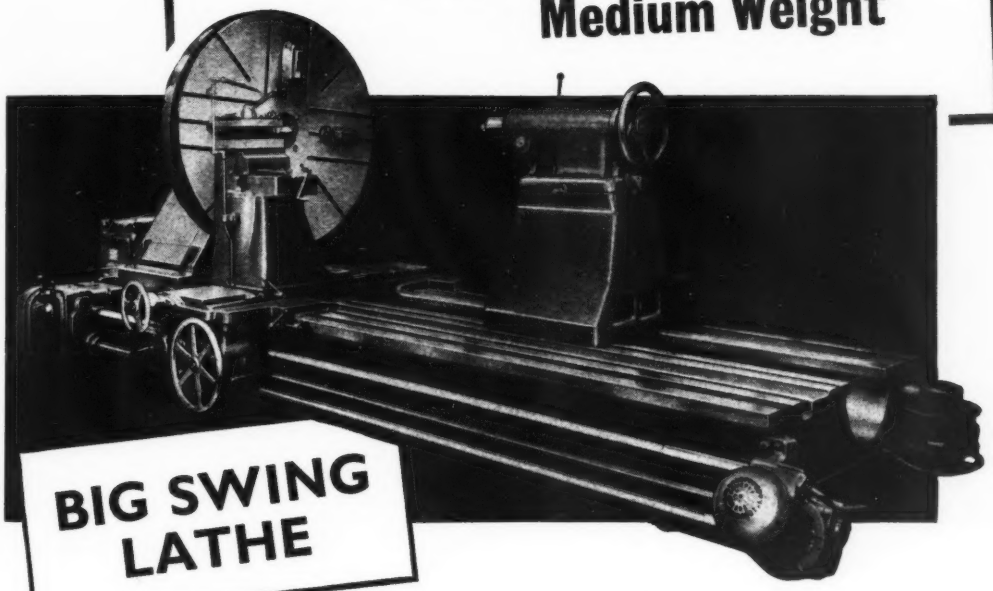

BIG SWING LATHE

The O & S Range also includes:

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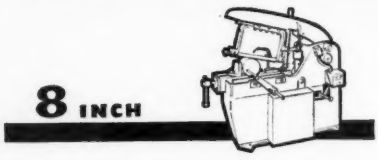

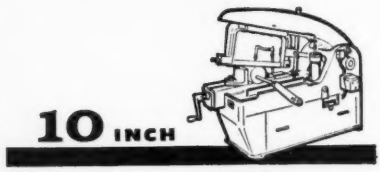

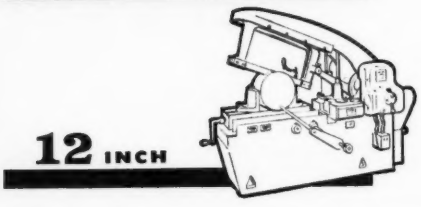

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Modern in design, robust and precise in construction, these unrivalled machine saws cut accurately and rapidly, and offer maximum production efficiency. Refinements include totally enclosed drive, hydraulic relief on the return stroke and automatic lifting of the bowslide to loading position on completion of cut.

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—and the famous SAWMASTER Autocut Power Bandsaw.

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The chisel shown below, made from Minerva L.C. Steel, was in constant use for 10 weeks, outlasting every competitive tool, and only discarded because the shank was too worn to be used any longer.

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MINERVA

TRADE MARK

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MINERVA L.C. for chisels, pneumatic percussion and boilermakers' tools.

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MINERVA Tool Steels are quite easy to manipulate, with a simple oil-hardening heat treatment, despite their special alloy content. Both Minerva L.C. and Minerva H.C. hold a good cutting edge and are extremely resistant to wear, combining both hardness and toughness, the H.C. grade being slightly the harder.

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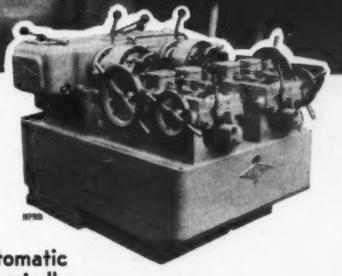
Landmaco threading machine



At the Imperial Foundry of the Ford Motor Co., Ltd., Leamington, 35-ton tensile steel hydraulic lifting rods are threaded (⅞" dia. × 9 pitch U.N.C. × 8" long) at the rate of 135 rods per hour. Spindle speed of 113 r.p.m. Leadscrew-controlled carriages ensure accurate thread reproduction; pitch error is only ·0003" over a 6" length.

Landis machines are available in a range of types and sizes:— Automatic Forming and Threading Machines — two sizes ¾" and 1". Four-spindle Semi-automatic Threading Machine — two sizes ¾" and 1". Lan-nu-rol and Lanhyrol Thread Rolling and Forming Machines 6C, 12C and 20C Landmaco Threading Machines with capacities of ¼" - ¾" bolt or ⅛" - ¾" pipe, ⅜" - 1½" bolt or 1⅛" - 1½" pipe and ½" - 2½" bolt or ¼" - 2" pipe respectively, single or double-spindle models. A complete range of Pipe Threading and Bolt Threading Machines also available.

ALFRED HERBERT LTD., COVENTRY Factored Division, Red Lane Works.

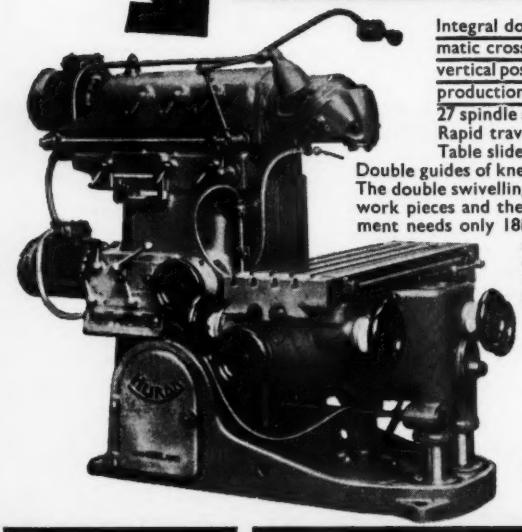
AD 612

SLIDING RAM GIVES 27½in. AUTO CROSS FEED

HEAVY DUTY MILLING

ANGULAR COMPOUND HORIZONTAL VERTICAL

HURON SUPER UNIVERSAL MILLERS



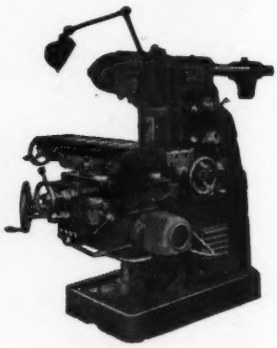
Integral double swivelling universal head provided with 27½in. automatic cross feed by the sliding ram, can be set to the horizontal or vertical position, or to any angle instantaneously—permits the heaviest production cuts. Head can be retracted completely from table line. 27 spindle speeds from 30 to 2,066 r.p.m., 27 feeds from $\frac{1}{16}$in. to 30in. Rapid traverses in all directions. All operating controls duplicated. Table slides directly in the knee without cross movement or swivel. Double guides of knee permit components in excess of 1½ tons to be machined. The double swivelling universal head requires an opening of only 14in. to enter work pieces and the whole sliding ram with its 27½in. automatic cross movement needs only 18in. clearance. OPTIONAL EXTRA FEATURES: Mounted spacing casting assemblies providing additional 8in. capacity under spindle. 26in. wide 8 T-slot tables and 39⅜in. automatic cross feed of sliding ram with special heavy duty knee and front operating position.

Type	Table	Automatic Feeds Long	Cross	Vert.
KU4	56⅛in. × 15¾in.	43½in.	27½in.	19⅝in.
KU5	64⅛in. × 15¾in.	51½in.	27½in.	19⅝in.
KU6	78¾in. × 16½in.	59in.	27½in.	19⅝in.
KU55	64⅛in. × 26in.	51½in.	39⅜in.	18⅛in.
L83	157in. × 59in.	118in.	39⅜in.	59in.

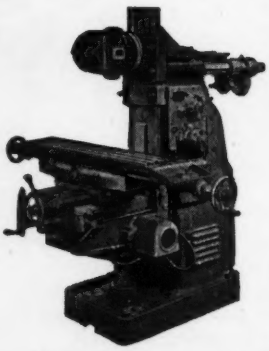
Type 'L' Open-side Traversing Head Universal Miller will mill, bore, slot and drill the largest work-pieces at one setting. The unique design permits greatest variety of operation on large work-pieces; the component remains stationary on the large work-table. Upright slides full length of base table and the sliding ram moves vertically and horizontally.

DUFOUR UNIVERSAL MILLERS

WITH DOUBLE UNIVERSAL SWIVELLING HEAD, RETRACTABLE SLIDE BRACKET AND SPACING CASTING GIVING 26" DAYLIGHT ON No. 59 AND 21" ON No. 61



FOR ALL MODELS Direct reading dial change for speeds and feeds. All parts subject to wear hardened and ground and completely interchangeable. Built to closest tolerances. Rapid traverses in all directions. Table swivels 30°. No. 40 taper for main horizontal spindle, double swivelling universal head, dividing head and rotary table. Hardened and ground centre guide for slideways. Twin overarms. Double swivelling sliding spindle heads with speeds 53-3000 r.p.m Double swivelling universal head on retractable slide bracket providing with 5½in. Spacing Casting Drive assembly on 59 Machine 26in. daylight, and 21in. on No. 61.



MODELS 53 & 61. 16 universal head spindle speeds 21-1600 r.p.m.; 8 horizontal spindle speeds 21-1180 r.p.m.; 8 automatic feeds ½-18¾in.

MODEL 59. 36 universal head spindle speeds 14-1780 r.p.m.; 12 horizontal spindle speeds 21-1180 r.p.m.; 16 automatic feeds ⅜-20in.

MODEL 54. Automatic cross feed of universal head 20in.; 18 universal head spindle speeds 12-1500 r.p.m.; 36 horizontal spindle speeds 6-1500 r.p.m.; 18 automatic feeds $\frac{5}{16}$-23⅜in.

Type	Table	Automatic Feeds Long.	Cross	Vert.
53	43½in. × 9¾in.	27½in.	9¾in.	15⅝in.
61	47½in. × 10¾in.	30½in.	9¾in.	15⅝in.
59	51⅞in. × 11¾in.	34⅛in.	11⅛in.	21⅛in.
54	67in. × 14½in.	43⅛in.	14½in.	20½in.

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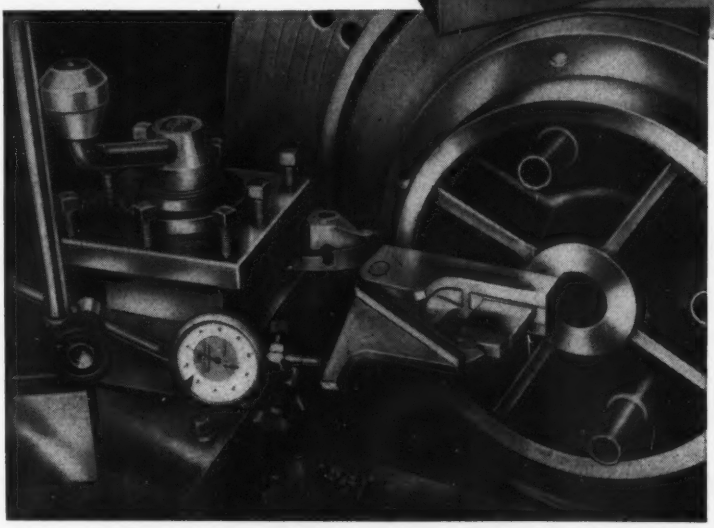

Essential for the rapid angular setting of machine tables, slides, toolholders or work to extreme limits of accuracy without using makeshifts. Permanent magnets incorporated in the base provide a positive lock-on to the work-piece or machine so leaving both hands free for setting operations.

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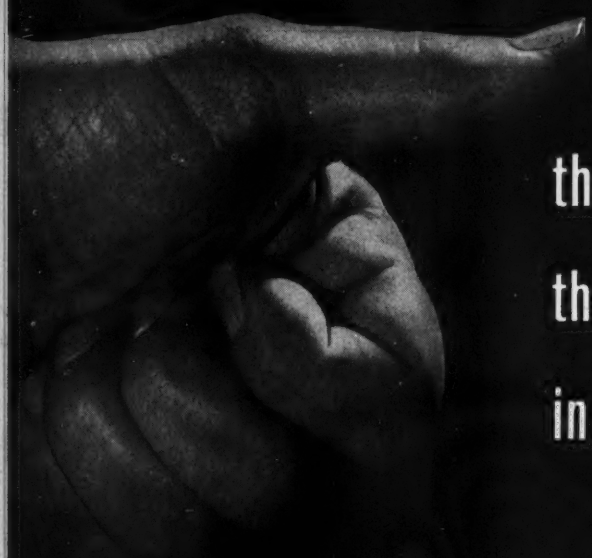

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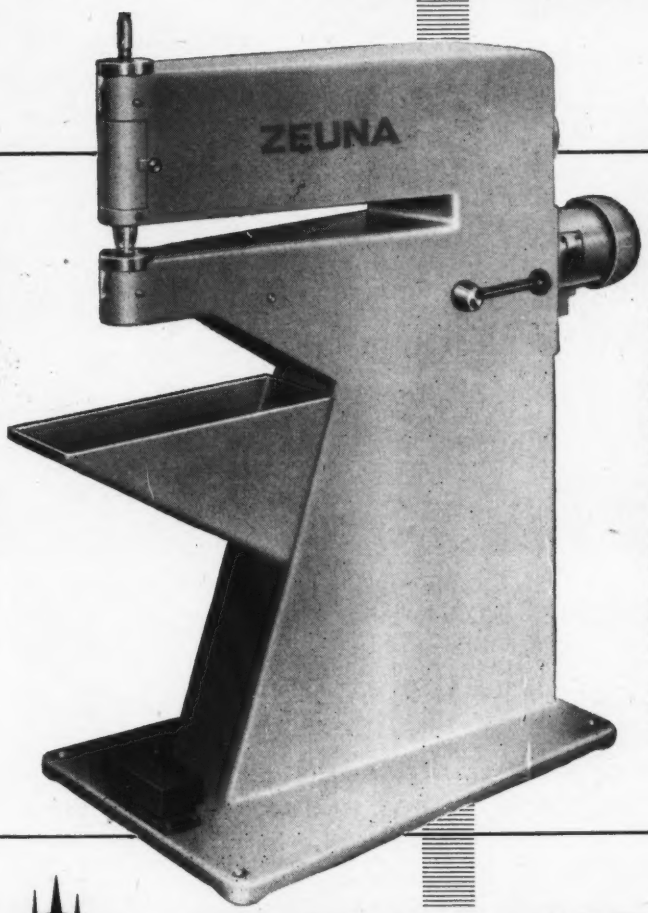

- The combined machine consists of a cantilever upper nibbling arm and a lower counteracting arm, both having a common drive.
- Permits the machining of metal sheets and bands of any length and width.
- The novel mounting of the holding down device makes it possible to cut a minimum inside radius of 0.32in. as well as any outside radius or acute angle; it even enables swivelling on the spot.
- Will cut any shape out of the centre of a metal sheet.
- The advantage of the counteracting lower arm consists in the narrowness of the cutting track. Cutting widths of 0.24 to 0.40in. can be obtained by merely interchanging the upper and lower dies. Such narrow tracks are often required for the cutting of slots.
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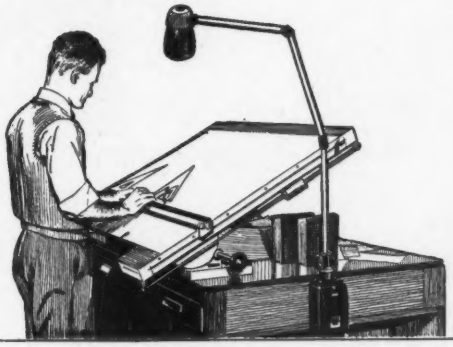

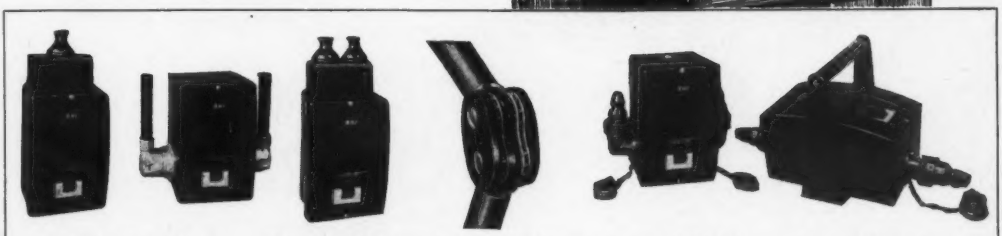

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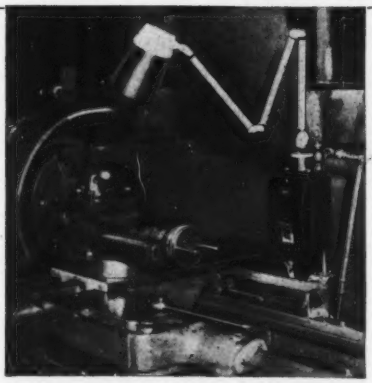

The transformer can also be built-in to a machine: the arms and shade can be mounted on wall, bench or machine remote from the transformer.

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BRIEF SPECIFICATIONS

Model	340-T	350-T
Diameter of spindle	4"	5"
Spindle motor	20 h.p.	25 h.p.
Spindle speeds (45)	10-1300 r.p.m.	7·5-975 r.p.m.
Max. table cross travel	132"	132"

EQUIPMENT AVAILABLE includes
EXTENDED SADDLE AND SADDLE SUPPORTS with in- or over-the-floor type auxiliary runways.
IMPROVED MEASURING DEVICE giving readings to 0·0001".
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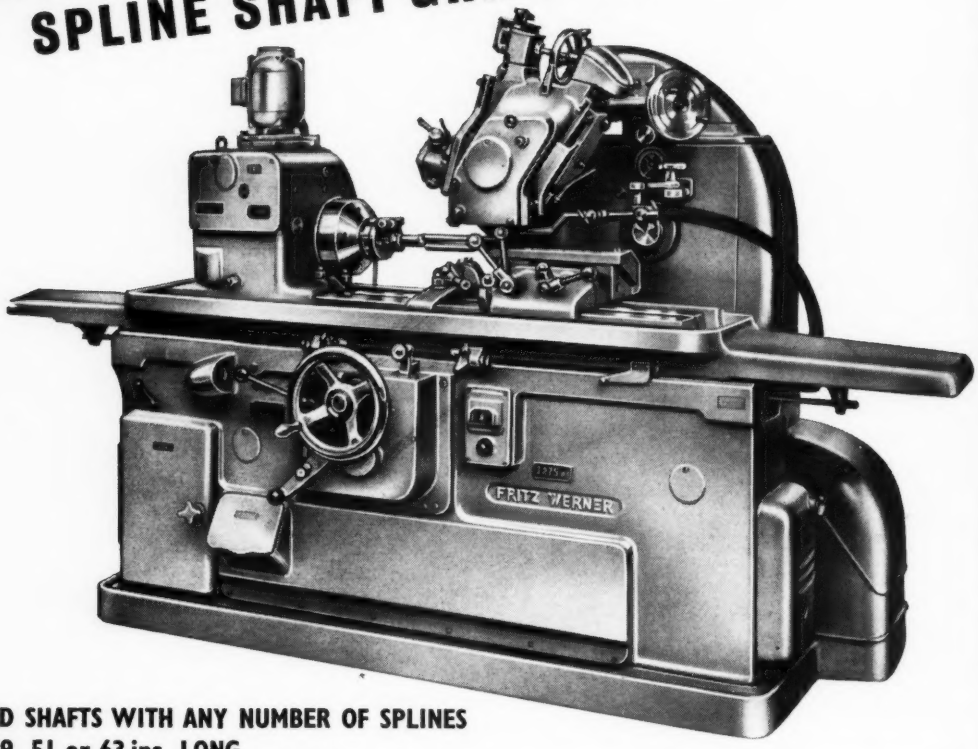

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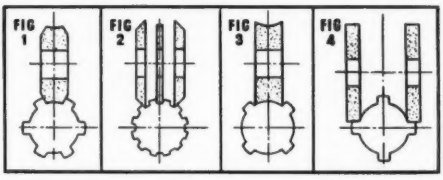
Built-in Diamond Dressers for truing grinding wheel without disturbing workpiece or table.

Special Dressing Devices available for certain gear forms.



The spline profile consisting of the root and two flanks can be ground in one cycle either by a single wheel formed to the full profile (Fig. 1) or by separate wheels (Fig. 2). With two successive cycles one wheel is used for the root (Fig. 3) and two wheels for the flanks (Fig. 4).

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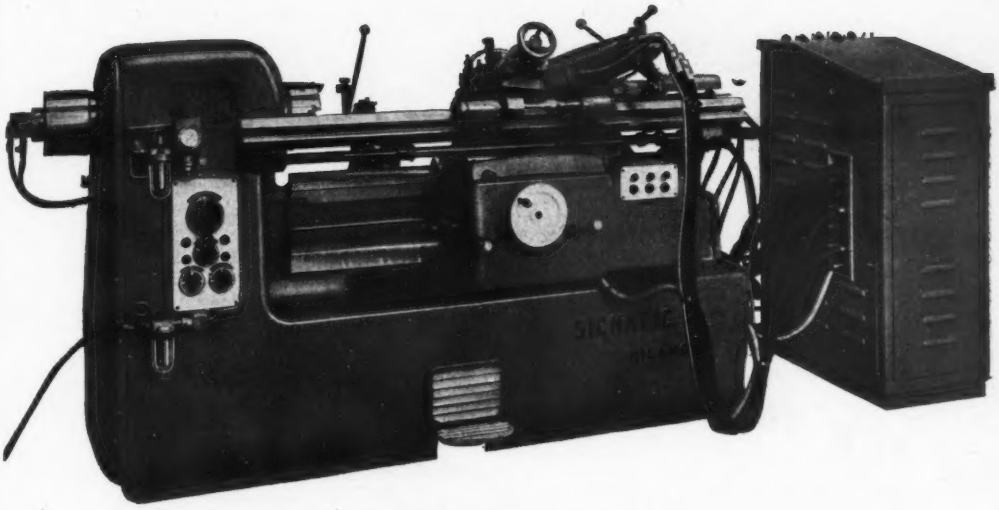

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Max. swing over bed	15¼in.
Max. swing over saddle	9⅜in.
Max. length turned	27½in.
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Number of feed rates to copying slide	48
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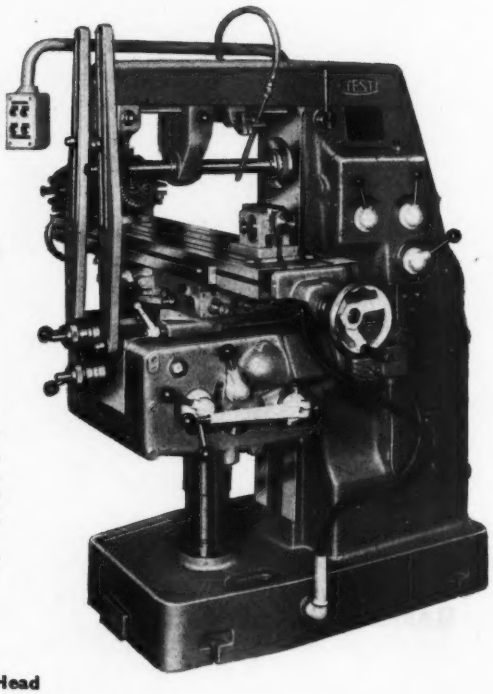

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Table Feeds:	Longitudinal	29in.
	cross (without brace) ..	9in.
	vertical	17¾in.
Spindle:	Spindle Nose ..	No. 40 N.S.
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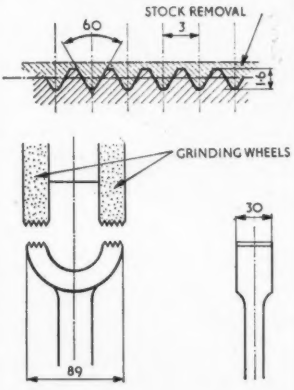
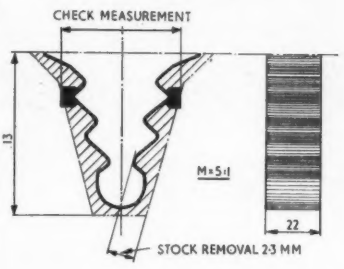


EXAMPLE 2



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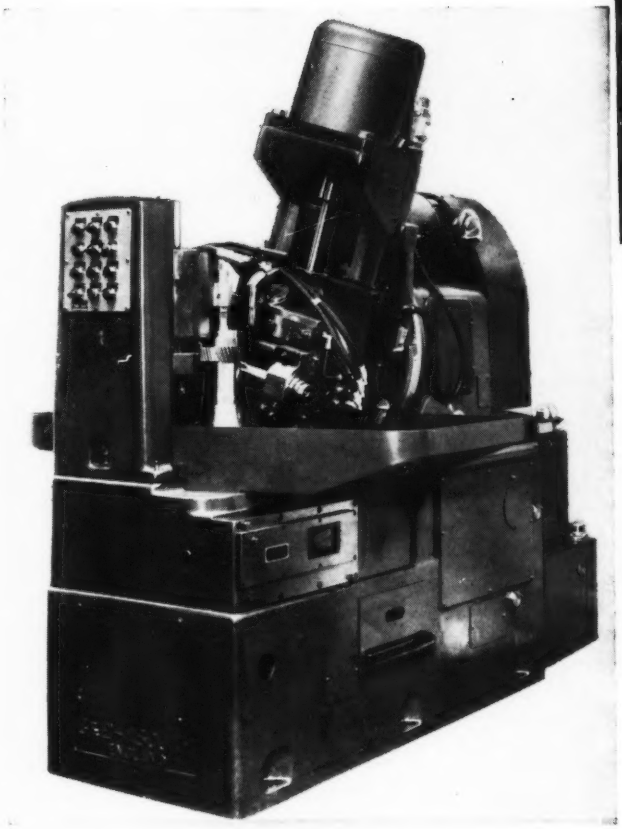

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The 12in. *HOBlique* is a completely new spur and helical gear hobber with a fully automatic cycle and has been compactly designed, with vertical work axis, to meet the demands for high speed, heavy feed, mass production of transmission gears, chiefly in the automobile industry and for other applications where quantity production of medium and medium-coarse pitches is required.

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The principle of moving the hob slide through the oblique plane when cutting helical gears has dispensed with leadscrew, differential gearing, guides and cams and simplifies set up procedure since no gear calculations are required.

MACHINE SPECIFICATION

Maximum rated Diametral Pitch in Steel	5 D.P.
Maximum Centre Distance, Hob to Work	9in.
Minimum Centre Distance, Hob to Work	1¼in.
Maximum Diameter Gear with 6in. Diameter Hob ..	12in.
Maximum Travel of Hob Slide	8in.
Maximum Hob Swivel Left and Right Hand	45°
Maximum Diameter of Hob	6in.
Main Motor h.p.	10

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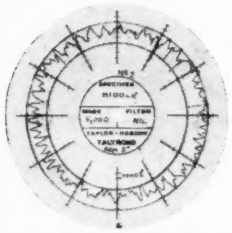

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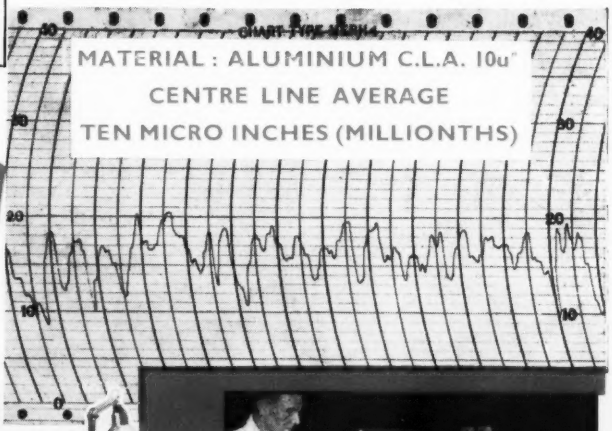

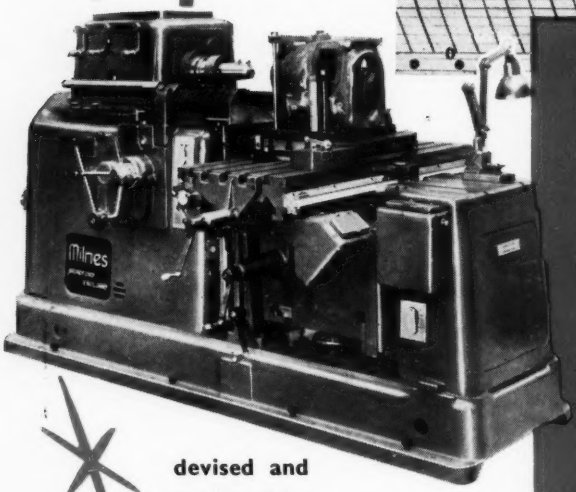

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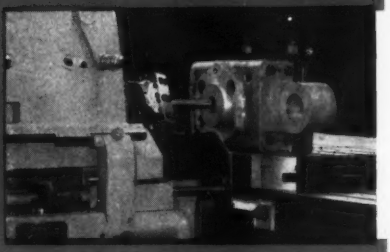

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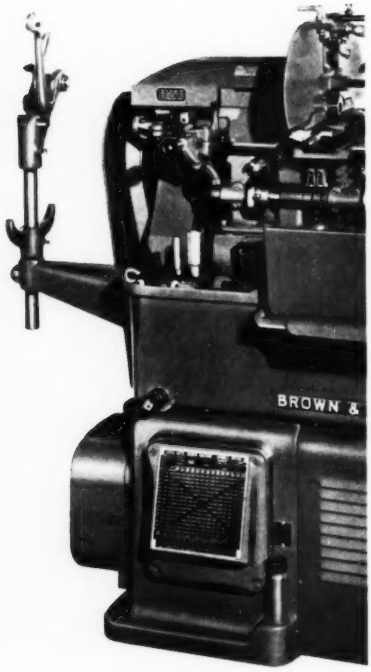

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of course you wouldnt. . . .yet you might easily be tempted into buying a machine which would give you only half the efficiency or productive capacity of a Brown & Sharpe Automatic

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When its a matter of productivity you must consider well all the many advantageous features of

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HIGH SPEED AUTOMATIC SCREW MACHINES

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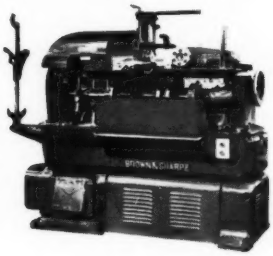

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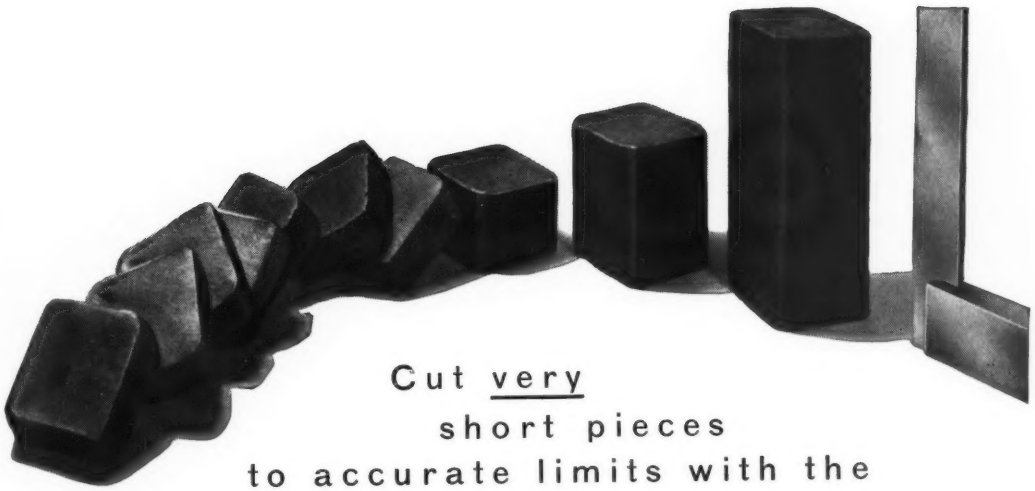
Modern Design gives wide versatility . . . Quick Changeover . . . Long Machine Life . . . Low Operating Cost . . . and Dependable Precision, with Continuous High Production on Broadest Range of Materials and Work Diameters. Time-Saving Features Assure High Production Efficiency.



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When answering advertisements kindly mention MACHINERY.

No other standard motor has all these features!

- All cast-iron exterior, the cowl openings meet the requirements of B.S.2817 for screen protection of rotating parts.
- Non-corrodible, polyester resin, external fan.
- Drain holes with easily detachable plastic plugs.
- Provision for fitting earthing terminal.
- Weatherproof type terminal box with 4-screw fixing.
- Nameplate with full details including bearing sizes and grease grades.

CLASS 'D' A.C. motors

DELIVERIES from stock

Are you receiving the monthly STOCK LIST?

If not, write to:
The ENGLISH ELECTRIC Co. Ltd.,
Industrial Motor Works, Bradford.

The new range of 'ENGLISH ELECTRIC' totally enclosed fan-cooled squirrel cage motors are interchangeable with ventilated motors to BS.2960 and have Class 'E' insulation for a permissible temperature rise of 65°C. For a given horsepower this means: SMALLER SIZE; LOWER WEIGHT; LESS COST.

THE NEW

'ENGLISH ELECTRIC'

class 'D' range of industrial motors

THE ENGLISH ELECTRIC COMPANY LIMITED, ENGLISH ELECTRIC HOUSE, STRAND, LONDON, W.C.2

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

DM.87B

961

Newman LEAD AGAIN

In electric motor manufacture with

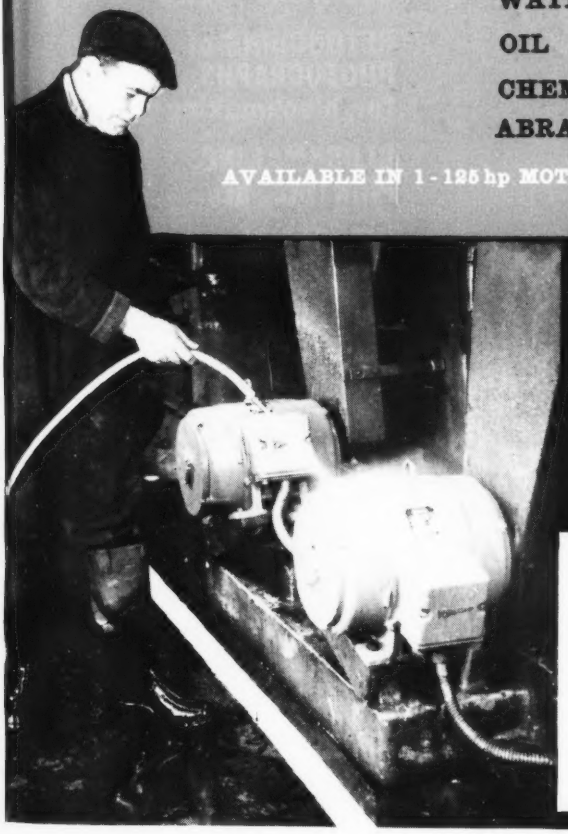
ENCAPSULATION *

* *impregnation and covering of windings with epoxy resin*

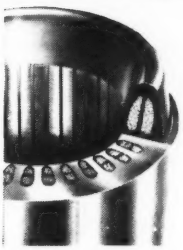
ENSURING PROTECTION *against damage by*

WATER
OIL
CHEMICALS
ABRASIVE ACTION *of airborne solids*

AVAILABLE IN 1 - 125 hp MOTORS



This illustration of the stator winding shows how the epoxy encapsulation completely covers and protects the coils.



A sectioned view showing how the stator conductors are embedded in the resin.

The most progressive name in electric motor design and manufacture

Newman

Electric Motors $\frac{1}{16}$ to 600 hp

NEWMAN INDUSTRIES LIMITED, YATE, BRISTOL, ENGLAND

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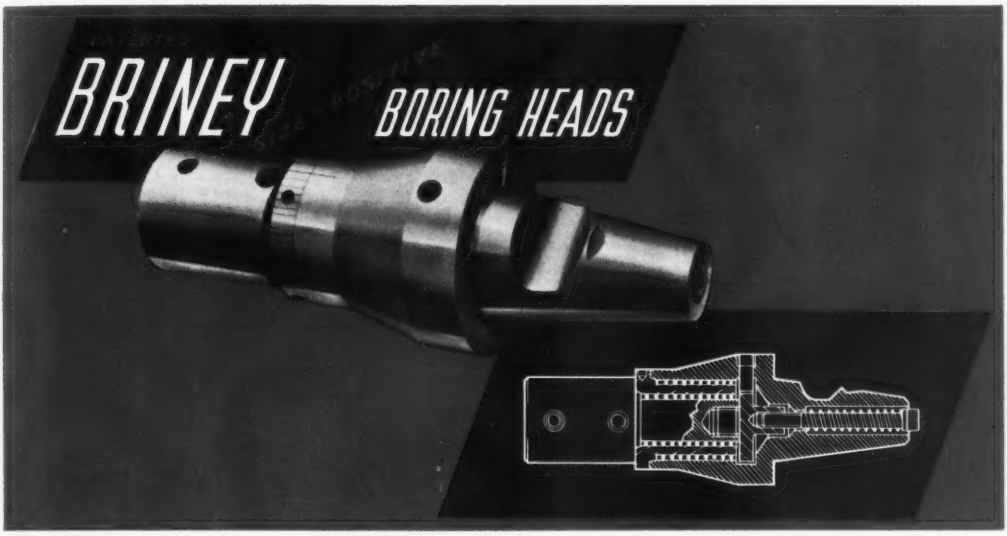

The Briney Principle consists of a bushing mounted on pre-loaded ball bearings between the taper and boring bar. The hole in this bushing is slightly eccentric with its outside diameter.

The boring bar is driven by the taper and is locked by an integral pin and lock nut unit. Inertia and spring tension on the bar prevent adjusting slippage. Rapid tool adjustment without loosening or tightening any part is accomplished by rotating the bushing with a spanner wrench.

This rotating action moves the bar mounted in the eccentric hole in a slight arc. This action results in a vertical range of adjustment for the tool, but which is held in the bar by conventional screw locks.

Adjusting control is provided by graduating the outer surfaces of the bushing in increments of 1/10,000 inch or larger. Standard graduations are in increments of .00025. Usual range of adjustment from initial setting is .006 inch or .012 inch on diameter. Practice has determined this range to be ample.

FEATURED ADVANTAGES

• PROVEN PERFORMANCE. Briney Size-Positive Boring Heads have long been accepted by the Automotive Industry and are replacing other heads and quills of the adjusting and non-adjusting type.

• SIZE CONTROL ACCURACY. Accuracy in size control is provided by the adjusting principle which requires no loosening or tightening. Number of adjustments can be kept to a minimum because high limit can be obtained in any setting. Results in longer tool wear and more continuous production before low limit is reached.

• TIGHT SEAL. Whole boring head assembly is sealed against coolant and foreign particle infiltration. Construction permits coolants to be applied to work directly through bars from spindle.

• RIGID CONSTRUCTION. Extreme rigidity due to assembly being made on pre-loaded bearings and high quality tool steels used in manufacture. Bar is positively driven and keyed to flange to eliminate backlash.

• PRECISION FINISHED. All finished diameters are held to close tolerances and boring heads are finish ground all over for balance controlling purposes.

• BALANCE Heads tested up to 9,000 R.P.M. before any out of balance conditions have been detected. Out of balance conditions kept to minimum because the mass weight of the head is concentric with all diameters. Light weight of bar and slight eccentricity of bar only minimize out of balance conditions when operating.

• LONG LIFE. Any moving part in assembly is used only in adjusting. Parts do not wear out through usage. Bars are replaceable in case of damage. Replaceable bars are less costly than solid quills.

• INCREASED PRODUCTION. Scrap is reduced and production increased due to rapid accurate size controlling adjustment feature. Accuracy and bore surface finishes eliminate successive operations such as honing or grinding.

QUALITY CONTROL. Ability to set tools to high limit on initial setting and maintain tolerance provides definite aid in maintaining statistical production quality control.

PRECISION GEAR MACHINES AND TOOLS LIMITED

An Associate Company of National Broach & Machine Co., Detroit, U.S.A.
"World's Largest Producer of Gear Shaving Equipment"

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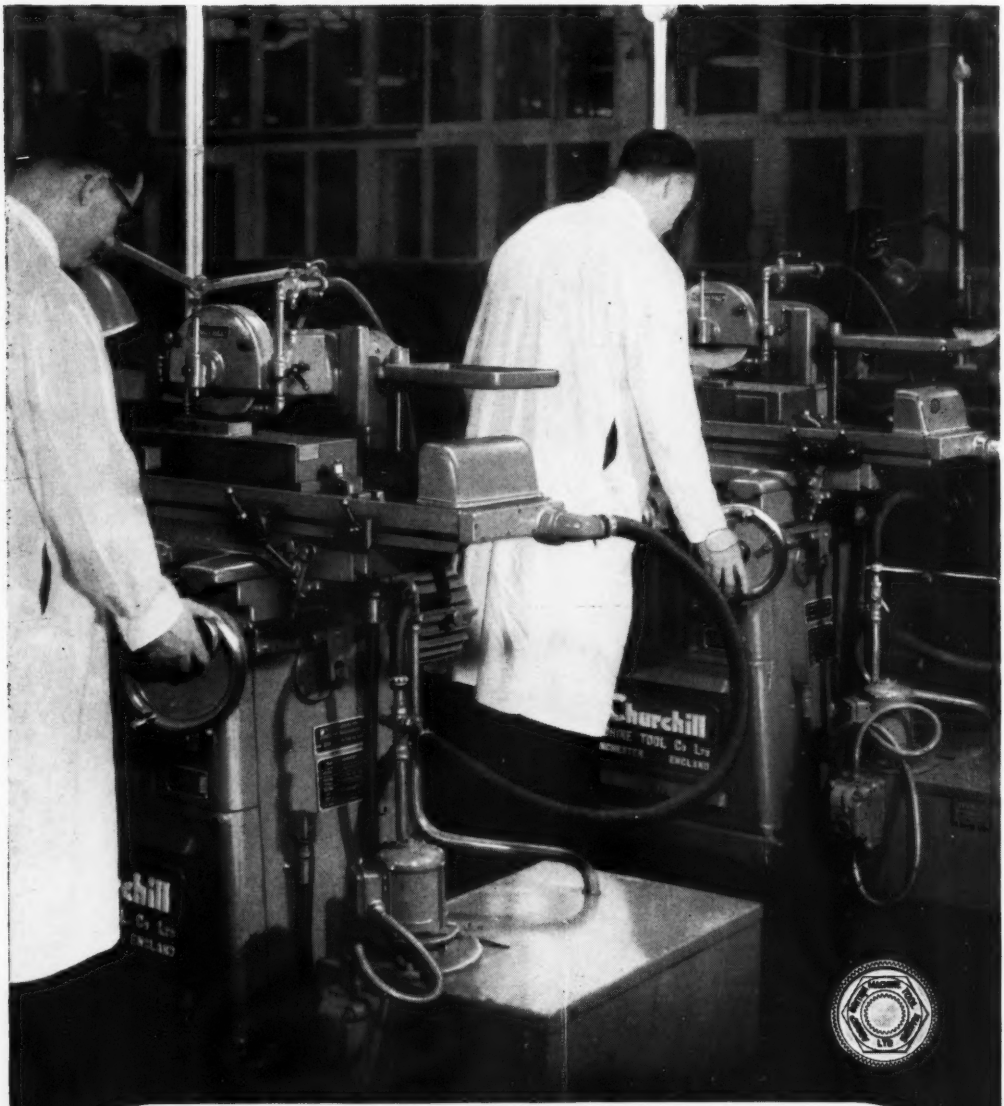

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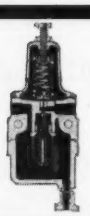
INDUSTRY WELCOMES THE NEW TECALEMIT RIBBON FILTER ELEMENTS

Setting a fresh standard of high efficiency filtration for

AIR—WATER—PETROL DIESEL AND FUEL OILS | LUBRICATING, HYDRAULIC AND OTHER FLUIDS

Chosen for the famous FISHER Small Volume Regulators

Tecalemit Ribbon Filter Element is used in the series 67 combination Filter Regulator, manufactured by Fisher Governor Company Limited of Rochester. In such an application, the paper ribbon filter allows air to flow freely and provide adequate filtration, and water separation. A Tecalemit ribbon filter is sufficiently robust to withstand pressure drops well in excess of normal working conditions.



Tecalemit Ribbon Filter Elements

Simple construction—Low cost—High flow rate—Easy to clean

The elements are formed to resin impregnated cellulose ribbon, wound helically and electrically fused into an open-ended cylinder. Innumerable microscopic orifices between the ribbons allow a very high flow rate, while retaining impurities on the outside or inside surfaces, according to direction of flow.

The standard range of diameters (in any length) covers most applications and no other filtration material can so readily be adapted to individual requirements for filters, strainers, breathers or separators. Never before has such fine filtration been possible at such low cost and with such flexibility in use.

Tecalemit Ribbon Elements filter to maximum purity

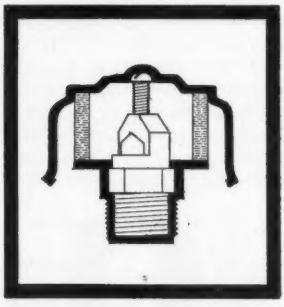
Tecalemit Air Breather Filters

(Incorporating Tecalemit Ribbon Filter Elements)

Cheapest—most efficient—cleanest to service Tecalemit Breathers act as ventilators to provide a free flow of clean air to hydraulic fluid, fuel and oil reservoirs. They give positive protection from airborne contamination to tanks, pumps, valves, cylinder and other engine components.

Of the standard types, two are breathers with screwed bodies, and the third is a combined clip-on assembly of breather and filter cap. All are fitted with Tecalemit Ribbon Filter Elements.

Tecalemit Breathers provide pure air cheaply and efficiently

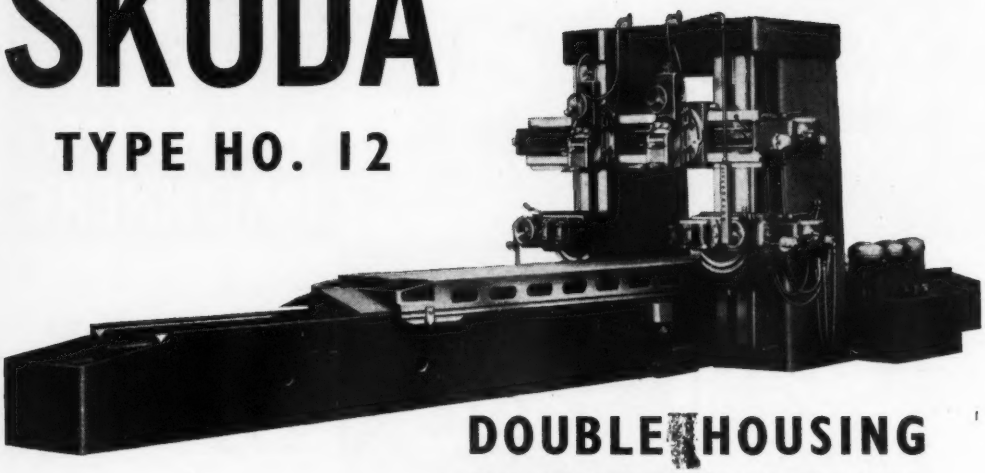


TECALEMIT the authority on filtration

TECALEMIT LIMITED · (SALES M) · PLYMOUTH · DEVON

SKODA

TYPE HO. 12



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ALSO AVAILABLE FOR EARLY DELIVERY:—**TOS TYPE H.85 D. H. PLANERS WITH TWO RAIL HEADS.**

6′ 6″ × 2′ 9″ × 2′ 6″	£2472
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We can offer "Skoda" Planing Machines up to a capacity of 32ft. 9in. by 10ft. 4in. by 10ft. 4in.

BRIEF SPECIFICATION:

Planing width: 4ft. 1in.
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Planing height: 3ft. 7in.
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Driving motor: Output, 18 kW.; Speed 940 r.p.m.

PRICE **£8320**

INCLUDING IMPORT DUTY AND TWO RAIL HEADS RIGHT AND LEFT HAND SIDE HEADS.

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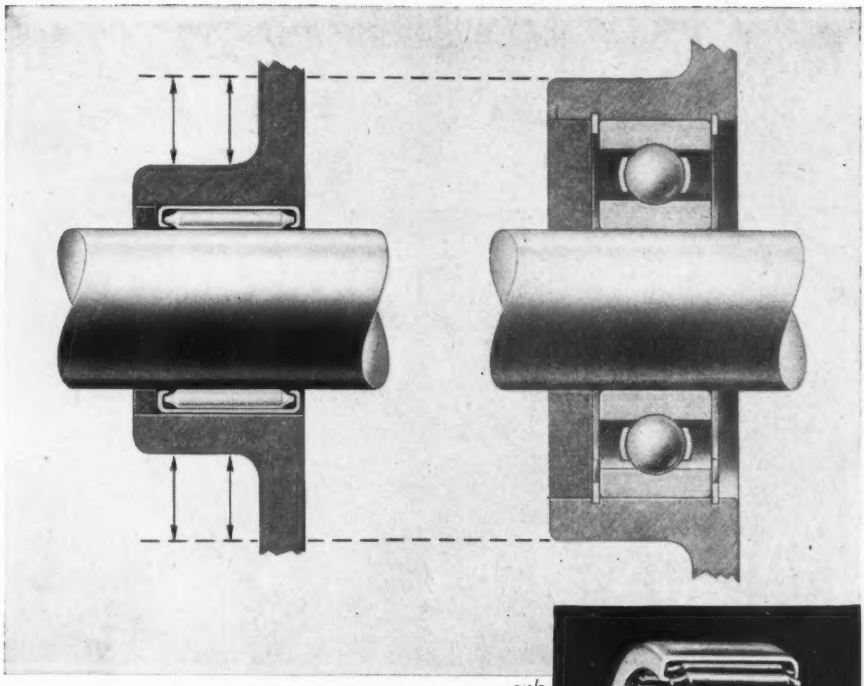
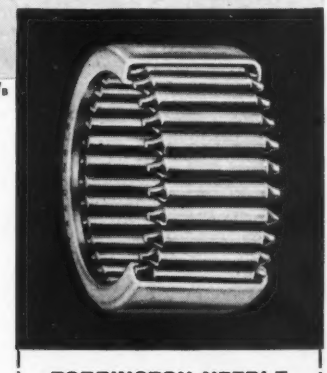
THE 600 GROUP



B61/B

Designed for compactness... Torrington needle bearings

More simple compact design is offered by the Torrington Needle Bearing in eliminating friction problems.
Offering a higher radial load capacity than any other bearing of comparable size the needle bearing has been proved in applications ranging from office machines to automobiles, washing machines to earth-moving machinery.
Whatever *your* product give it the benefit of our anti-friction know-how.
Our technical representatives will be pleased to call on you.



TORRINGTON NEEDLE BEARINGS FEATURE:

- *High radial load capacity*
- *Low co-efficient of starting and running friction*
- *Low unit cost*
- *Long service life*

THE TORRINGTON COMPANY LTD

Bearings Division: Torrington Avenue, Coventry
London and Export Office: 7-10 Eldon Street, EC2
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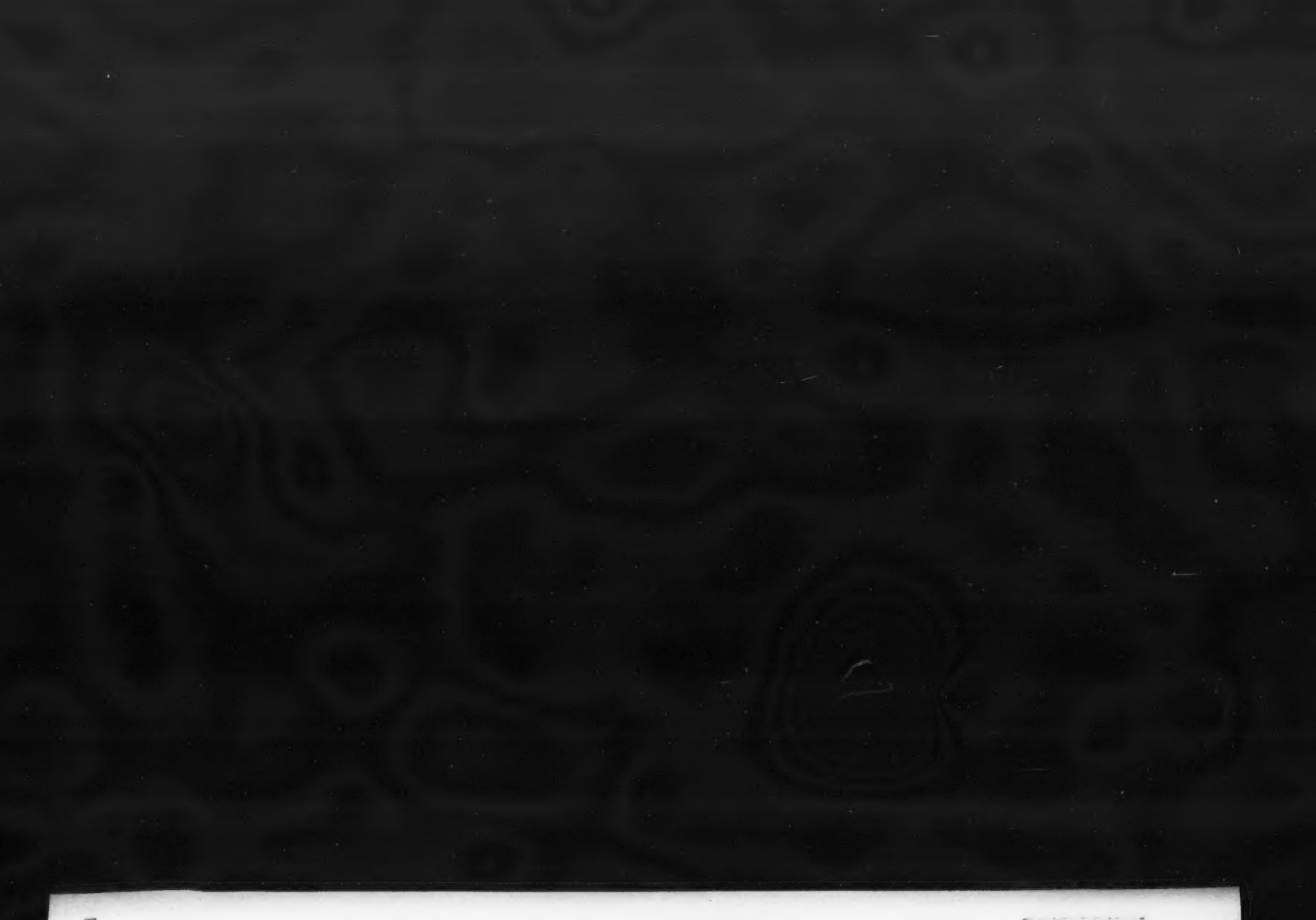


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Quadriflex
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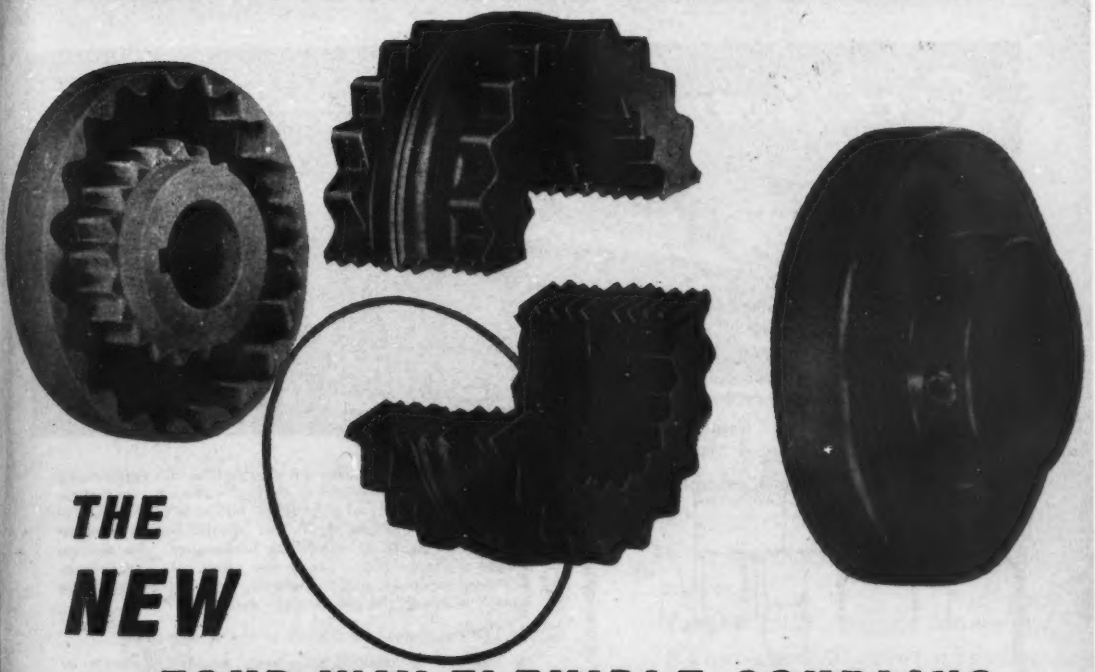
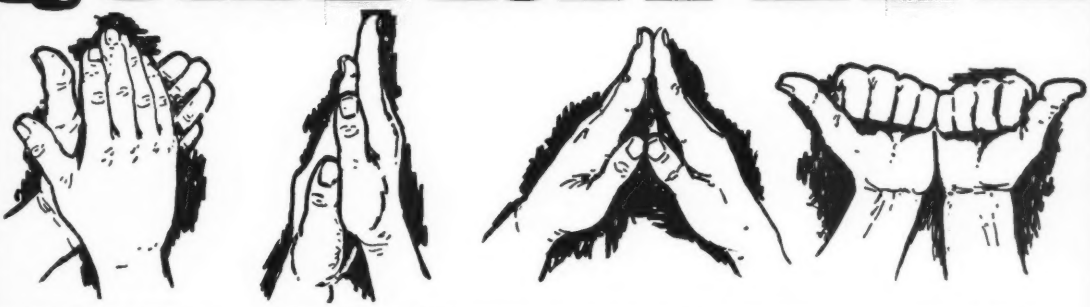
SIMPLE, SAFE & TROUBLE FREE



THE NEW FOUR WAY FLEXIBLE COUPLING

QUADRIFLEX



SHOCK AND VIBRATION

Quadriflex couplings absorb from 5 to 15 times more shock and vibration.

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Quadriflex couplings absorb parallel misalignment up to $\frac{1}{16}$ inch.

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Quadriflex couplings take angular misalignment up to 1°

END FLOAT

Quadriflex couplings compensat for as much as $\frac{1}{4}$ inch end float.

FOR FURTHER INFORMATION PLEASE QUOTE REFERENCE No. Q/10.

Quadriflex flexible couplings are designed for

PEAK PERFORMANCE · LESS MAINTENANCE · GREATER FLEXIBILITY
EASE OF INSTALLATION · LOWER INITIAL COST

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THE NAME WHICH MEANS DEVELOPMENT IN POWER TRANSMISSION

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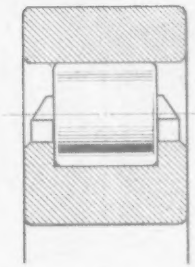
R&M parallel roller bearings

meet the case, when shock loads occur, and shafts expand or contract



These bearings are in earthworking and bulk handling equipment, in vibrating screens, electric motors and other machines of all shapes and purposes.

Parallel roller bearings made by Ransome & Marles possess exceptional advantages. Most, for example, incorporate the exclusive R&M broached cage which increases the unit's strength/weight ratio; there are super-blended rollers for exacting applications, single and double row series, self-aligning bearings—bearings of all sizes and capacities.

Publication 37 is a comprehensive guide. Consult the R&M Technical Department for advice or assistance of any kind to do with bearings. Ransome & Marles knowledge is at your disposal without charge or obligation, and your enquiry will, of course, be treated as confidential.

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DIATEST

HIGH PRECISION Small-Bore Gauge

DIATEST Gauges are the solution to your checking problems!

NO MORE TROUBLE GAUGING

blind bores,
tapered boars,
incomplete bores,
barrel-shaped bores,
out-of-round bores,
where other bores interfere

DIATEST Gauges can be operated by unskilled labour.

DIATEST Unit Heads are hard chromium plated to withstand wear.

Minimum Bore - - - - 3/64in.
Readings in - - - - - 0·0001in.
Range - - - - - 0·047in.-1·500in.

ALL PARTS INTERCHANGEABLE

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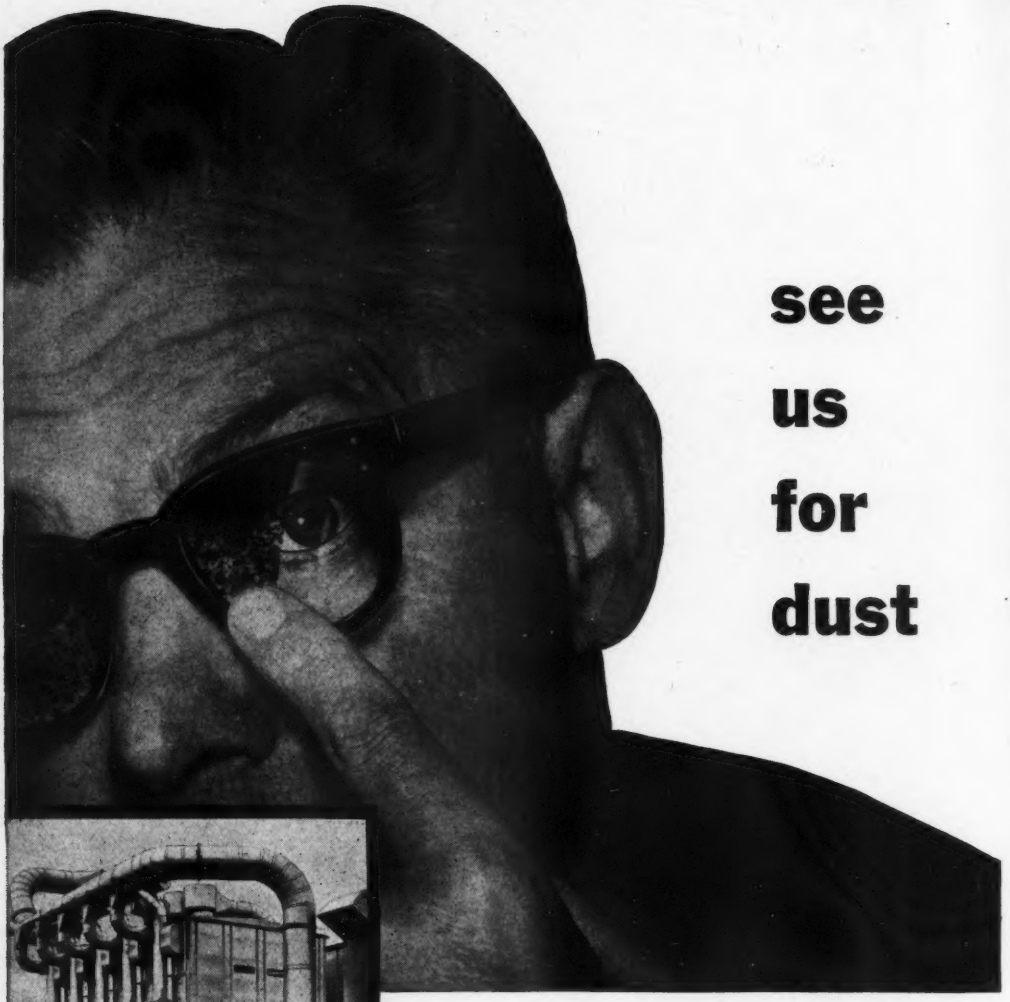
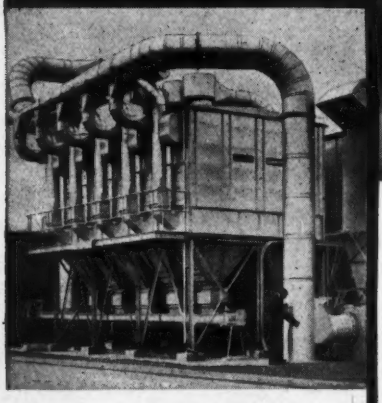


see us for dust



This is a Dallow Lambert Drytube
Type 3/5000 fabric sleeve dust filter handling 16,000 cfm. of dust laden air with drag link conveyor system for discharging dust into storage hopper for automatic bagging.

During 40 years of specialization in industrial dust control we've learned the answer to most dust problems. Take fine dry dusts such as graphite for example. Our answer to them has been the Drytube dust filter, which is particularly suitable for handling fine dry dusts where high collection efficiency is required.

DALLOW LAMBERT

DALLOW LAMBERT LIMITED · THURMASTON · LEICESTER · TELEPHONE SYSTON 3333 (7 LINES)

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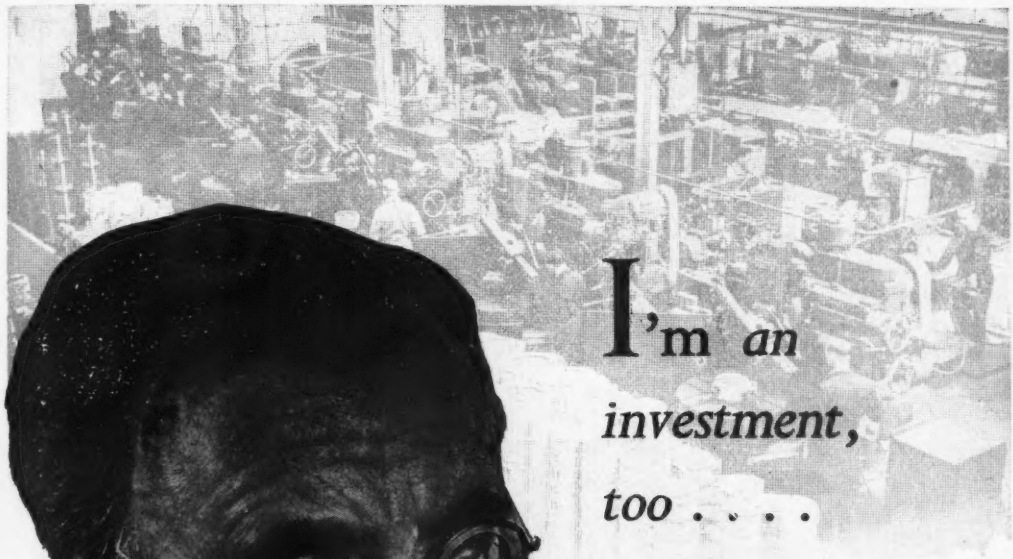


I'm *an investment, too . . . .*

Someone once said;

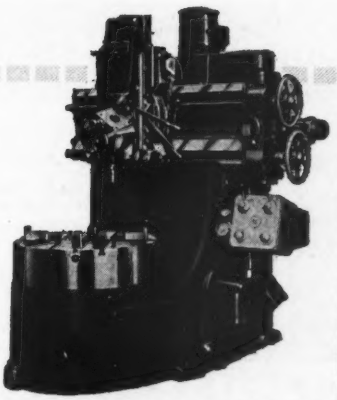
"Money is like time—
use it or lose it!"

That goes for us piece-workers too. Give us the chance to earn more by producing more, and we pay dividends.

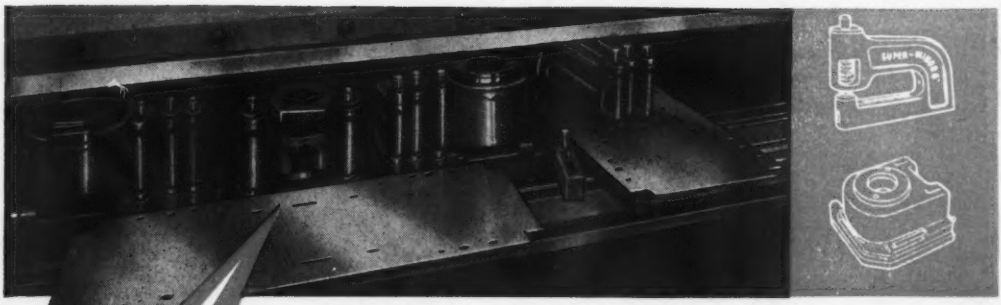
Companies investing in a realistic plant replacement policy find their reward in higher consistent output, keen and contented workpeople, and bigger profits.

When the machines in question are boring mills as popular as the Webster & Bennett, they are prepared to order well in advance. This is one of the reasons why we can seldom offer machines for early delivery.

Ought you to see about a replacement order now?



WEBSTER & BENNETT LTD., COVENTRY, ENGLAND



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REDMAN

UNITOOL SYSTEM

Patent Nos. 639079 & 647163

TRANSFER PRODUCTION ON ANY PRESS OR PRESS BRAKE WITH LOW COST!

Standard UNiPIERCE and UNiCROP Units cut the cost of tooling and get you into production faster.

At a fraction of the usual cost our standardised units make possible multi-operation transfer work on all types of Presses and Press Brakes. Full details and technical help without obligation. Catalogue UP/1002/M4 on request.

REDMAN TOOLS & PRODUCTS LTD.

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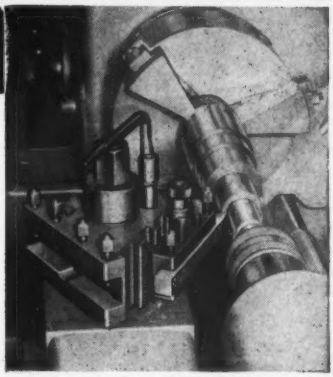
Tel: Worcester 26933 (4 lines) 'Grams: Redtools, Worcester. Northern Agents: Dunmac Ltd., 123 Hope Street, Glasgow C.2. Tel: Central 0421/2.

'TRIPAN' TOOLHOLDERS

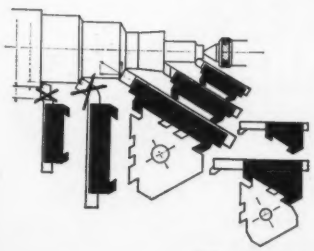
ensure consistent accuracy & high output

Centre lathe output practically that of a capstan

- Setting-up time reduced. Height of tool quickly adjusted by self-locking screw.
- Large or small toolholders can be used on the same clamping block. The most economical toolbit size can be chosen, e.g., large cutters for roughing and small ones for finishing.
- The clamping block does not rotate and therefore positioning errors due to worn parts are eliminated. The toolholders are locked on three faces ensuring constant accuracy of positioning.
- Any number of toolholders can be used in rotation, including parting off, boring bar and twist drill holders.
- The triangular shape ensures: improved visibility, reduced tool overhang, tool presented to the work from the most effective angle.



The TRIPAN (patented) system comprises a triangular clamping block and a range of interchangeable toolholders. The clamping block is selected according to the centre height of the lathe and the toolholders according to the size of the cutter and the work to be done.



TRIPAN DESIGN ENSURES RIGID ASSEMBLY—VITAL FOR CARBIDE CUTTERS

This diagram shows—on the right—the correct TRIPAN cutting positions. Note the reduced tool overhang and how the full cutting power is utilised. Avoid cranked tools and the cutting positions shown on the left—these are inefficient.

Sole Concessionaires

ACBARS LTD

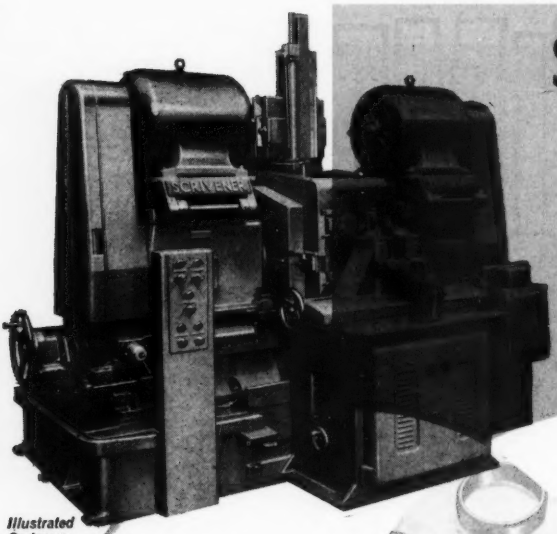
16/18 MACLEOD ST., LONDON, S.E.17

Telephone: RODney 7191-2-3

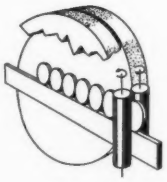
SCRIVENER

Duplex

Face Grinding Machine

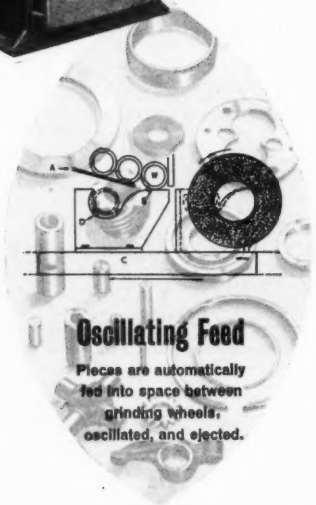


Illustrated Scrivener 24/30



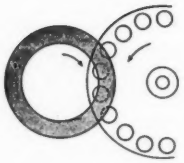
Roller Feed

Flat work-pieces capable of being rolled are best fed between vertical pressure rollers.



Oscillating Feed

Pieces are automatically fed into space between grinding wheels, oscillated, and ejected.



Rotary Feed

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In this article, the second in a series devoted to the works of Maquinas Agricolas Romi, S.A., builders of IMOR lathes, reference is first made to the foundry, which has an output of 250 to 300 tons per month. Forging equipment is then discussed, including a Romi-built screw press, of 1,000 tons capacity, and an air hammer also built by the company. A special Romi rack-cutting machine is then described, on which the racks are generated by a rotating gear-type cutter, at high output rates. Reference is made to a large East German boring machine, and to a special Romi machine for boring headstocks and tailstocks, which has temperature control arrangements for the boring heads. Operations on a Hurth programme controlled keyway cutting machine and a Warner & Swasey tapping machine are considered, and a special Blanchard grinder is described. Finally, the gear cutting facilities at the Santa Barbara plant, and the gear cutter record system, are discussed. (MACHINERY, 98—8/2/61.)

Producing Components for Domestic Lawn Mowers .. .. P. 303

In this article, details are given of some of the metal patterns employed at the works of Ransomes, Sims & Jefferies, Ltd., Ipswich, for casting components for Sprite and Conquest lawn mowers, including the driving gear for the former machine. These castings are machined on a B.S.A. automatic, which incorporates special equipment for pressing an Oilite bush into the bore as part of the automatic cycle. Finally, reference is made to a Herbert 2-spindle drilling machine which is equipped with a multi-spindle head, also a single-spindle angular head, for operations on land wheels for the Conquest machine. (MACHINERY, 98—8/2/61.)

Colforg Cold Forming Machines and Equipment .. .. P. 308

Power presses and associated equipment in the Colforg range introduced by Cold Forging, Ltd., 29 Hanworth Road, Sunbury-on-Thames, Middlesex, and Saarlaendische Werkzeug- und Maschinenfabrik, W. Nothelfer, G.m.b.H., Lockweiler, W. Germany, have been specially designed for the production of parts by cold forging. The range includes cropping machines for producing forging slugs from steel bar, a hydraulic pre-forming machine, and machines for chamfering slugs at one end to facilitate loading into forging dies. In addition, there is a 10-station hydraulically-operated unit for de-greasing, pickling, and phosphating slugs. When these treatments have been completed, lubricant is applied to the surfaces of the slugs by a separate unit. (MACHINERY, 98—8/2/61.)

Production Engineering in a Stationery Factory .. .. P. 313

Substantial improvements in output have been obtained at the stationery factory of Spicers, Ltd., Sawston, Cambs., by the introduction of new machinery and plant, and the adoption of improved production methods. Blanks for envelopes, for example, are now produced on a machine which is fed with paper from a reel of 4-blank width, the paper being separated into four webs with interlocking edge patterns, and re-coiled. Another special machine has been developed by the company to facilitate the cutting of diamond-shaped envelope blanks, and is operated by air cylinders. (MACHINERY, 98—8/2/61.)

Pearlitic Malleable Iron .. .. P. 315

Pearlitic malleable iron is now being used for the production of components that were hitherto made from steel castings or forgings, largely on account of the ease with which the material can be selectively hardened. Moreover, the good bearing properties of the material have permitted the elimination of separate running bushes in many instances. Hardening of the material is simple, since it is only necessary to heat components by any conventional method, and quench in any of the normally-employed media. Among the parts now being made from pearlitic malleable iron may be mentioned rocker arms, clutch hubs, gears and crankshafts. (MACHINERY, 98—8/2/61.)

Producing Electric Motor Shafts on a Maxipilot Lathe with Bar Feed .. P. 320

Wolf Electric Tools, Ltd., have recently installed a modified Drummond-Asquith Maxipilot automatic profiling lathe, to increase the output of electric motor shafts. Non-standard features incorporated include a collet, a Birfield automatic bar feed attachment, a special tailstock with a 60-deg. female centre, and a dummy tailstock that operates in conjunction with the bar feed attachment. One shaft-blank is produced every 2½ min. to 3½ min., depending on length, and details of the automatic cycle are given. Previously, when the shaft-blanks were produced on capstan lathes, the production time was 6 min. to 7 min. each. (MACHINERY, 98—8/2/61.)

Contributions to MACHINERY

If you know of a more efficient way of designing a tool, gauge, fixture, or mechanism, machining or forming a metal component, heat treating, plating or enamelling, handling parts or material, building up an assembly, utilizing supplies, or laying out or organizing a department or a factory, send it to the Editor. Short comments upon published articles and letters on subjects concerning the metal-working industries are particularly welcome. Payment will be made for exclusive contributions.

EDITORIAL

Capital Expenditure by Manufacturing Industry

During the post-war years there have been very important developments in connection with many types of plant employed in manufacturing industry, including machine tools, and as a result much of the existing equipment has been rendered wholly or partially obsolete, when judged by the latest standards, regardless of its age or mechanical condition. This situation, if it is allowed to persist, must inevitably affect the competitive position of British firms, particularly in overseas markets. At the same time, the cost of plant and machinery is tending to rise fairly rapidly, partly on account of the general upward trend in prices and partly because of the greater complexity and refinement of the equipment that is now available. It follows that if we are to maintain our position as a country which exists largely by the export of manufactured goods, capital expenditure by industry must be sustained at such a level as will ensure the necessary standards of productive efficiency.

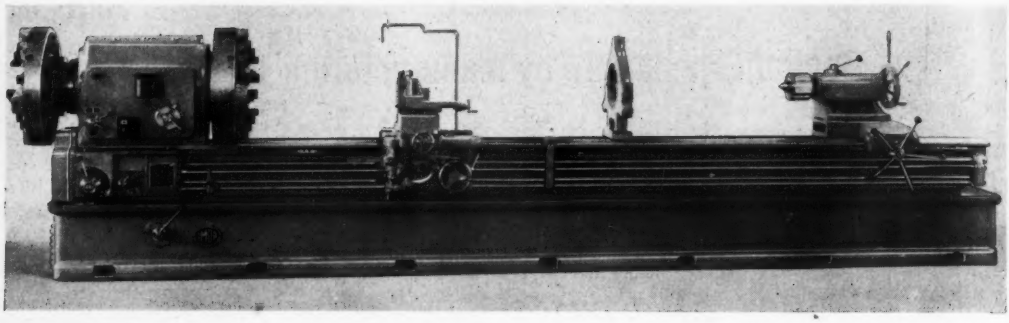
According to the figures published in the *Monthly Digest of Statistics*, fixed capital expenditure by manufacturing industry was rising fairly rapidly during the period immediately prior to and including 1957. In that year, at current prices, the total outlay was £903 million, of which £620 million was accounted for by plant and machinery, and £243 million by new building and works. As an indication of the effect of the upward trend of costs, however, it may be noted that if these figures are converted to average 1954 prices, the total is reduced to £767 million, and the expenditure for plant and machinery becomes £521 million. Following the "credit squeeze" which was begun in the autumn of 1957, capital expenditure fell to £893 million in 1958 and £820 million in 1959 (at current prices). In fact, the position in these years was considerably worse than such figures indicate, because when they are converted to 1954 prices the totals become £729 million and £671 million, both of which are lower than the adjusted figure for 1956. By 1959 the amount expended on plant and machinery had declined to £566 million at current prices, or £450 million at 1954 prices, and it will be apparent from these figures that the rise in price, as between the two years, was slightly more than 25 per cent.

During the first nine months of 1960 the downward trend was sharply reversed and for this period total capital expenditure by manufacturing industry was at an annual rate of £952 million at current prices, or £773 million at 1954 prices. The latter figure, it will be noted, was slightly higher than the corresponding sum for the peak year 1957. When plant and machinery only is considered, however, it is found that the annual rate of expenditure for the period from January to September, 1960, was £633 million, at current, or £491 million at 1954 prices. This adjusted figure, although it showed an improvement on that of 1959, was still below those of 1957 and 1958. If the adjusted and unadjusted figures for plant and machinery expenditure in the 1960 period are compared, it will be found that the increase in prices from 1954 was nearly 29 per cent.

Some indication of the probable scale of capital expenditure this year is afforded by estimates which have been made by the Board of Trade on the basis of forecasts submitted by a sample of companies, although it is pointed out that such estimates must be accepted with caution since manufacturer's plans are liable to alteration. The estimates suggest that expenditure on plant, machinery, and vehicles, by manufacturing industry, will be nearly 30 per cent greater than in 1960. If this percentage figure is applied to the adjusted (estimated) total of £491 for plant and machinery, quoted above, it is found that the anticipated expenditure under this heading for the current year (at 1954 prices) is of the order of £640 million. Such a total would be substantially higher than has hitherto been achieved and would do something to offset the deficiencies of 1958 and 1959.

Separate figures for expenditure on machine tools are not given in the general statistics, but from other information available it may be deduced that the value of such machines installed in British factories last year (at current prices) was of the order of £87 million. In view of the fact that home orders on the books of British builders at the end of October amounted to nearly £80 million, and of the comparatively high rate of imports which at present prevails, it is probable that the value of machine tools delivered in this country in 1961 may appreciably exceed the 1960 total.

In general, therefore, it appears that the immediate prospects for the builders of manufacturing plant of various types, including machine tools, are favourable, since a rising export trade is likely to be supplemented by increasing demands from customers at home. It is to be hoped, moreover, that this higher rate of investment by industry will be permitted and encouraged to continue.



A Brazilian Machine Tool Plant

Methods and Equipment Employed for the Production of Lathes in Large Quantities by Maquinas Agricolas Romi, S.A.

By P. A. SIDDERS, Chief Associate Editor

IN THE FIRST ARTICLE of this series,* some details were given of the growth of the Brazilian machine tool company, Maquinas Agricolas Romi, S.A., also of the plant at Santa Barbara d'Oeste, in the state of Sao Paulo. Reference was also made to some typical IMOR lathes from the range of 35 types built by the company, and to the machining and grinding of lathe beds. An Oil Country lathe, type MHS, from the Romi range, is seen in the heading illustration of this article. Driven by a 30-h.p. motor, the lathe has a spindle with a bore of 12 in. diameter. Work up to 16 ft. long can be mounted between centres, and the centre height is 15¾ in. Before going on to describe the machining of certain lathe components, it may be of interest to discuss some aspects of the Santa Barbara plant.

Brief mention was made of the foundry in the previous article, and the present capacity of this department is 250 to 300 tons of castings per month. Machine moulding is employed, and castings with weights up to 12 tons can be produced. Facilities are not adequate for the major castings required for the largest lathes in the IMOR range, and these castings are obtained from an outside supplier. At the time of the visit on which these articles are based, extensions to the foundry were planned, which will provide for an output of 600 tons of castings per month, and permit the production of castings up to 25 tons in weight—adequate for the largest lathe components. The expansion plans provide for extensive mechanization of the foundry, and the installation of two electric furnaces, with melting capacities of 5 and 15 tons, in addition to the facilities already installed, which include cupolas with capacities of 5, and 7 to 8 tons per hour. Arrangements are also being made for the production of Meehanite and spheroidal graphite cast iron. There is a chemical and metallurgical laboratory in which all raw materials are analyzed and the composition of each batch of castings is checked. A shot-blasting plant provides for the initial cleaning of castings.

There is a well-equipped heat-treatment department, and the furnaces installed include one electric and two oil-fired units, for hardening, annealing and tempering operations. The tempering furnace was built by the Brazilian company of Brasimet, under licence from the German firm of Degussa-Dufferit. Two Brasimet salt-bath furnaces are installed, one for pre-heating and the other for case-hardening, and there are three Holden salt-bath furnaces, fitted with control equipment supplied by Minneapolis-Honeywell Regulator Co.

ROMI-BUILT FORGING EQUIPMENT

All gears fitted to IMOR lathes are machined from forgings and there is a large forge shop at the Santa Barbara plant. Among the equipment there

* MACHINERY, 98/116-18/1/61.

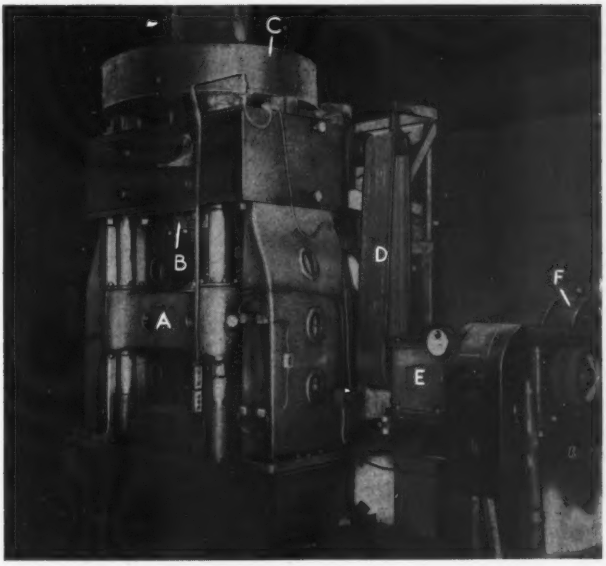


Fig. 1. Screw type forging press of 1,000 tons capacity which was designed and built by the Romi company in the remarkably short period of 120 days. The press is employed principally for the production of gear blanks

installed may be mentioned a Bêché 100-Kg. air hammer, a Pilkington type 815 air hammer, a Romi air hammer and a Romi forging press. The latter machine is shown in Fig. 1, and it may be noted that at the time when this unit was required, it was impossible to import such a press, and no press of the required size was made in Brazil. It was therefore decided to design and build a machine at the Santa Barbara plant, and the press was installed in the remarkably short period of 120 days from the time that design was begun.

Fig. 2. This Romi-built air hammer is used for forging operations on the smaller gear blanks at the Santa Barbara plant. The maximum travel of the 12-cwt. tup is 71 in.

The Romi press has a maximum forging capacity of 1,000 tons, and is of the screw type. Four steel columns, of 8-in. diameter, connect the base and crown, which are constructed by welding from steel plate. These columns resist the main forging stresses, and at each side of the press there is a cast-iron pillar which is bolted and keyed to the base and keyed to the crown, these pillars serving to resist any twisting forces. Fitted with bronze guide bushes, the platen *A* is moved on the four steel columns by a steel screw, which engages a long bronze nut *B* secured to the crown. The diameter of the screw is 11¼ in., and it has a 2-start right-hand thread, of 4 in. pitch. Drive is taken from a 100-h.p. motor *F*, at the rear, through multiple V-belts to the gearbox *E*, which incorporates hydraulically-operated multiple-disc clutches, and provides three speeds in both the forward and reverse directions. Multiple V-belts *D* connect the gearbox to an overhead shaft, whence the screw is driven through spiral bevel and double reduction spur gearing, the large final driving gear being enclosed in the casing *C*. The gearbox provides ram speeds from 16 to 62 in. per min.

Fig. 2 shows the Romi-built air hammer, which is used principally for forging the smaller gear blanks. As may be seen, the hammer is of simple design, and the tup *G*, which weighs approximately 12 cwt., slides on cylindrical steel columns. These

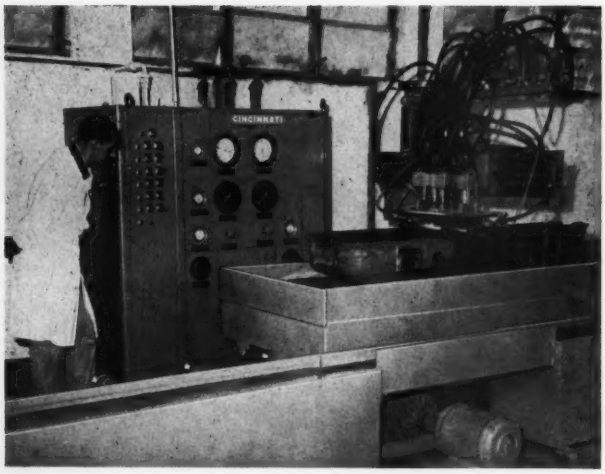


Fig. 3. Close-up view of a hardening operation on a lathe bed on a new Romi machine, fitted with Cincinnati Flamatic equipment

in the previous article, and it has now been completed. Fig. 3 is a close-up view of a hardening operation on the slideways of a lathe bed on the new machine. This machine provides for hardening the guideways to 550 Brinell on beds up to 26 ft. long. The bed of the flame-hardening machine is 52 ft. long, and the table is driven during the working traverse by a Kopp variable speed unit, with an overall speed ratio of 1:3. A separate rapid traverse motor and gearbox are fitted and provide an overall speed ratio of 1:6. Cincinnati Flamatic flame-hardening equipment is employed, and the burners are designed and made by Romi.

A planned programme of machine rebuilding and a preventive maintenance system are in operation. Moreover, each machine in the Santa Barbara works is oiled and greased in accordance with a schedule, and a lubrication chart is enclosed in a plastics envelope attached to each unit. The chart embodies a sketch of the machine, with the various lubrication points indicated, and the type of lubricant, also the

columns are mounted in weld-fabricated brackets secured to the base of the hammer, and support the crown and air cylinder *H*. The tup is connected to the piston of the cylinder, which is of 8 in. diameter, and operates on a supply pressure of 75 lb. per sq. in. Air is directed to the cylinder through an impulse valve, and the sudden application of air pressure, during the working stroke, serves rapidly to increase the acceleration of the falling tup, and consequently its kinetic energy. The maximum travel of the tup is 71 in.

Maquinas Agricolas Romi design and build a number of production units for use in the works, and at the time of our visit, a flame-hardening machine for lathe beds was under construction in the maintenance shop. This machine was mentioned in connection with operations on beds

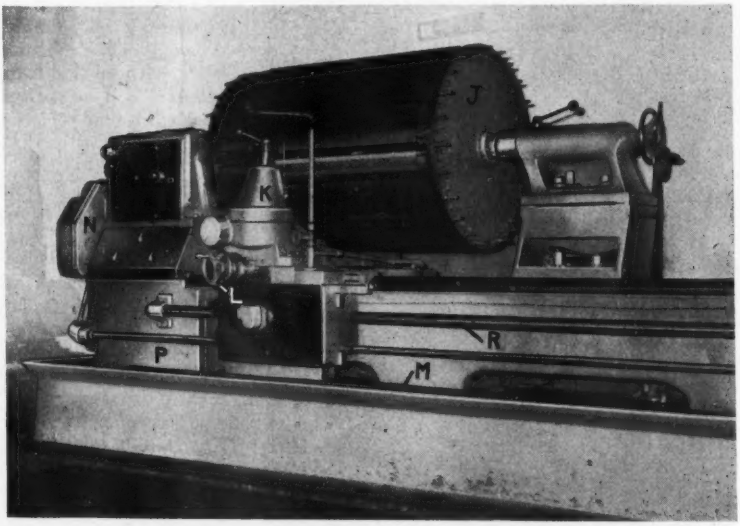


Fig. 4. A special rack cutting machine which has been developed and built by the Romi company. Racks, approximately 40 in. long, are mounted in the large rotating drum, and the teeth are generated by a rotating and traversing gear-type cutter. The cutting time for each rack is 12½ min.

method and frequency of application are specified.

SPECIAL ROMI RACK-CUTTING MACHINE

Production equipment built by the Romi company includes the special rack-cutting machine seen in Fig. 4. Apart from loading and unloading, this machine is completely automatic in operation, and the design is the subject of a number of patents. As may be observed, the machine is based on a standard IMOR lathe, and raising blocks have been fitted beneath the headstock and tailstock to increase the centre height to accommodate the work-carrying drum *J*. Electrical controls are built into the raising block for the headstock, and a switch panel is mounted on the front of the block. The headstock and tailstock are of the type fitted to the standard IMOR type MVN lathe.

The rack teeth are generated by a special circular cutter, to which reference will be made later, and a special apron and saddle are fitted to the machine, to support the cutter head *K*. This head incorporates a cutter spindle inclined at 6 deg. towards the work, and is mounted on a cross-slide, operated by the handwheel *L*, which is provided with a micrometer drum. The apron has a slide block fitted to its bottom face, and this block bears on an additional slideway *M* on the bed, to support the apron and saddle assembly against the thrust of the cutting operation.

Drive to the apron is taken from the headstock by way of change gears in the housing *N*, through an inclined shaft and 90-deg. bevel gearing to the main shaft *P*. This shaft extends for the whole length of the bed, and at the end remote from the headstock, is connected to the feed-screw *R*. The latter is engaged by a conventional split nut in the apron for traversing the cutter head along the bed during the cutting phase of the operation cycle, and it can be over-driven by a separate motor to provide a rapid traverse motion. Drive to the cutter spindle is from the shaft *P*, through worm gearing.

The drum *J* is mounted on a shaft which is supported by the special tailstock quill and the headstock spindle, and it is driven by the latter at a speed of 14 r.p.m. A close-up view of the drum is given in Fig. 5, and it holds 48 rack-blanks, each 1 metre (39⅜ in.) long, and 19 mm. (¾ in.) wide. The blanks are of SAE 1045 steel, and on each it is required to cut 151 teeth, of 2·25 module and 20 deg. pressure angle. Of high-speed steel, the cutter *S* was made by Romi, and is similar to a master gear, with one side face ground to produce a dish angle of 11 deg. The 6-deg. inclination of the cutter spindle automatically provides front clearance, and results in an effective top rake of 5 deg. A cutter is produced by first machining a blank, then cutting the teeth on a Fellows gear shaper, hardening, and finally grinding the teeth on a Maag machine.

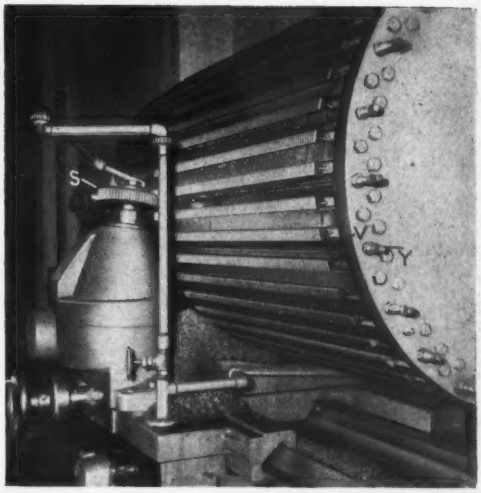


Fig. 5. Close-up view of the work-carrying drum and the cutter head on the Romi rack generating machine. The drum holds 48 rack blanks, and is driven at 14 r.p.m.

For generating the rack teeth, the cutter is fed in to depth with the drum rotating and the apron at the tailstock end of the work. Drive to the apron is then engaged, and the cutter is traversed along the bed at a feed rate of approximately 0·12 mm. (0·0047 in.) per rev. of the drum. The relationship between the feed rate and the speed of rotation of the cutter is so arranged that the teeth produced on the racks are at 90 deg. to their longitudinal axes. "Crowned" teeth are automatically obtained, due to the rotation of the drum, each tooth being of the correct thickness at the centre, and approximately 0·03 mm. (0·0012 in.) thinner at the ends. Teeth are cut on a complete batch of rack blanks in less than 10 hours, which is equivalent to 12½ min. per rack.

WORK CLAMPING ARRANGEMENTS

Before the blanks are delivered to the Romi rack-generating machine, each is ground on the bottom and both side faces, and the method of clamping the blanks is shown diagrammatically in Fig. 6. The drum is of built-up construction, and a series of fixed bars, as at *T* in Fig. 5 and 6, is bolted to the heavy-section end plates. Each bar is of T-section,

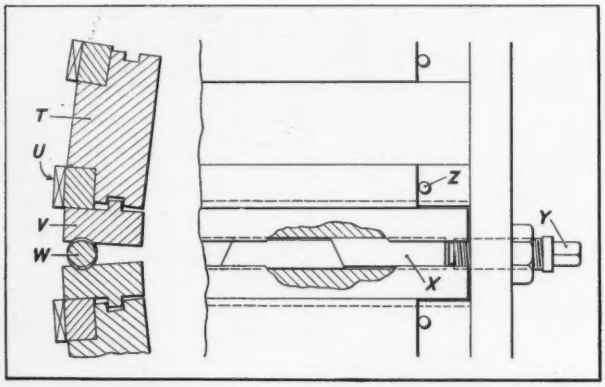


Fig. 6. Diagrammatic view of the clamping arrangements for rack blanks on the drum of the Romi generating machine

and at each side there is a seating groove for a rack blank, as indicated at *U* in Fig. 6. The length of the arms of the T-form is slightly less than the width of the blanks, so that one edge of each blank overhangs. A groove is machined along each arm of the bar, and is engaged by the integral key of a clamping bar *V*, and between each pair of fixed bars there is a pair of clamping bars, one of each hand. On the side of each clamping bar opposite to the integral key is machined a groove of arcuate section, and along the length of these grooves, between each pair of clamping bars, are assembled short lengths of hardened steel rod, as at *W* in Fig. 6. The length of each rod is about 4 in., and the end faces are ground at an angle of approximately 10 deg., so that those on each rod converge. When the rods are assembled, they are arranged so that the inclined end faces are in contact, with the major axis of each elliptical face (as produced by grinding) at 90 deg. to a radius of the drum.

The arrangement is such that once the various components have been assembled, the clamping bars and rods are free to move sideways, but are retained between the fixed bars. A rod with one square end is assembled at each end of each stack of rods, as at *X*, and pressure can be applied to the stack by a screw, as at *Y* in Fig. 5 and 6.

When the rack blanks are loaded into the drum, each is located endwise between pegs, as at *Z* in Fig. 6. The screw *Y* is then tightened, to apply pressure to the stack of rods. Due to the angles on the end faces, alternate rods are thrust up and down (as viewed in Fig. 6) so that the two clamping bars of each pair are forced apart, and into contact with the rack blanks on the facing sides of two fixed bars, with the result that the blanks are held firmly in their seatings. After the screw *Y* has been tightened securely, it is locked with a nut.

EAST-GERMAN BORING MACHINE

The Romi rack cutting machine is installed in the heavy machine shop, to which reference was made in the previous article, and other equipment in this department includes a large East-German horizontal boring machine. Designated type BFT 125/1, this machine was built by VEB Werkzeugmaschinenfabrik Union Gera, and it has a spindle of approximately 5 in. diameter, which can be traversed longitudinally through a distance of 44 in. The working surface of the rotary table is 55

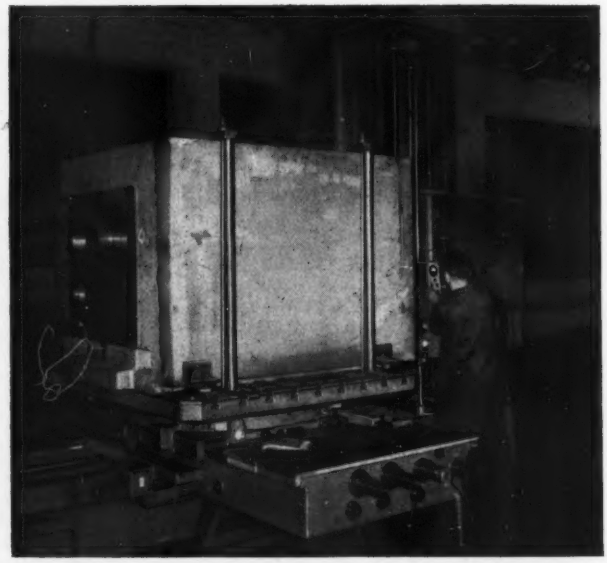


Fig. 7. Machining the headstock casting for a type TP100 lathe, the largest in the current IMOR range, on an East-German Union type BFT 125/1 horizontal borer

by 63 in., and the saddle and cross-slide have traverses of 78¾ in. and 63 in. Outboard supportways are provided for the saddle, and the maximum height of the spindle above the table is 59 in. Spindle speeds range from 2·2 to 450 r.p.m., and feed rates from 0·0002 to 1·890 in. per rev., and the drive is by a 20-h.p. motor.

Fig. 7 shows the boring machine set up for operations on the headstock of an IMOR type TP100 roll turning lathe, which is the largest in the current Romi range. This lathe is of 820 mm. (32⅜ in.) centre height, and is available with bed lengths to admit from 4 to 10 metres (13 ft. 1½ in. to 32 ft. 9¾ in.) between centres. The bed is fitted with sectional prismatic steel guideways, which are hardened and ground. A maximum diameter of 1,100 mm. (43⅜ in.) can be swung over the cross-slide. Five different ranges of 27 spindle speeds are available, the highest range being 5 to 125 r.p.m., and the lowest, 1 to 25 r.p.m. There are eight feed rates, from 0·113 to 2·822 mm. per rev. (0·0045 to 0·111 in. per rev.) longitudinally, and from 0·111 to 2·778 mm. per rev. (0·0044 to 0·109 in. per rev.) in the transverse direction.

Main driving motors up to 100 h.p. can be fitted, and a 5-h.p. motor provides rapid traverse at a rate of 16·6 ft. per min. The TP100 lathe weighs 61 tons and three machines of this type have already been sold.

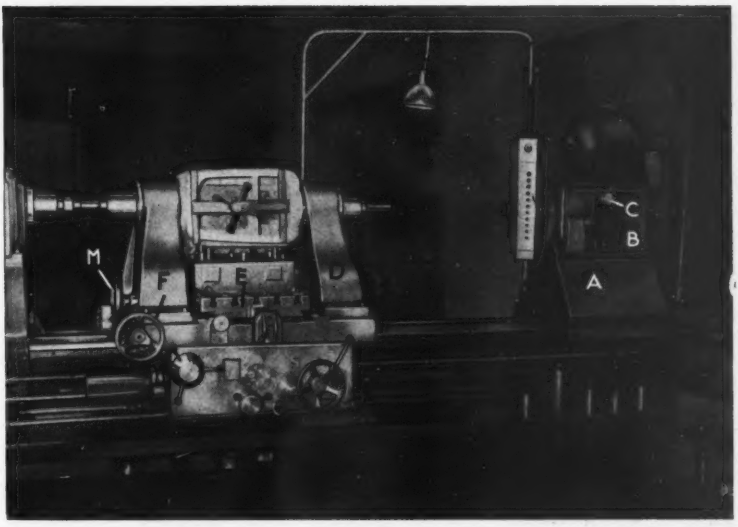


Fig. 8. Special-purpose, double-ended boring machine designed and built by Romi for operations on lathe headstocks and tailstocks. Preheated oil is circulated through each boring head to maintain constant temperature conditions

BORING HEADSTOCKS AND TAILSTOCKS

The Romi company has built a special-purpose machine for boring the headstocks and tailstocks of IMOR type NTCN and NTPN lathes, and this machine is seen in Fig. 8, set up for operations on an NTCN headstock. A 20-in. wide bed, of normal lathe type, with an inverted-vee guide at the front and a flat way at the rear, supports raising blocks at either end, as at *A*, whereon are mounted headstocks, as at *B*. The headstock and block at the left-hand end of the bed are fixed in position, but the units at the other end can be moved along the bed-ways as an assembly.

Each headstock is of the type normally fitted to the company's type MVN lathe, and has a spindle mounted in Timken taper-roller bearings. A 5-h.p. motor, on top of the headstock, drives the spindle through V-belts and sliding gears, and a range of 8 spindle speeds, from 40 to 1,000 r.p.m., is available.

In order to ensure that constant running conditions are maintained in the headstocks, each is supplied with oil that is pre-heated to a specific temperature. Oil is delivered by a motorized pump from a reservoir in the switchgear cabinet at one side, and this reservoir incorporates an electrical resistance heating element, controlled by a thermostat. A dial-type thermometer, as at *C*, is fitted to each headstock, in order that the temperature may readily be checked by the machine operator.

Between the two headstocks there is a saddle and apron assembly, and at either side of the saddle are mounted rigid support brackets, as at *D*, for the boring bar guide bushes. The saddle has transverse dovetail guideways, between the brackets, whereon moves a cross-slide *E*. At the front of the bed there is a feed screw, which is engaged by a split-nut assembly, in the apron, to traverse the saddle on the bed for the cutting

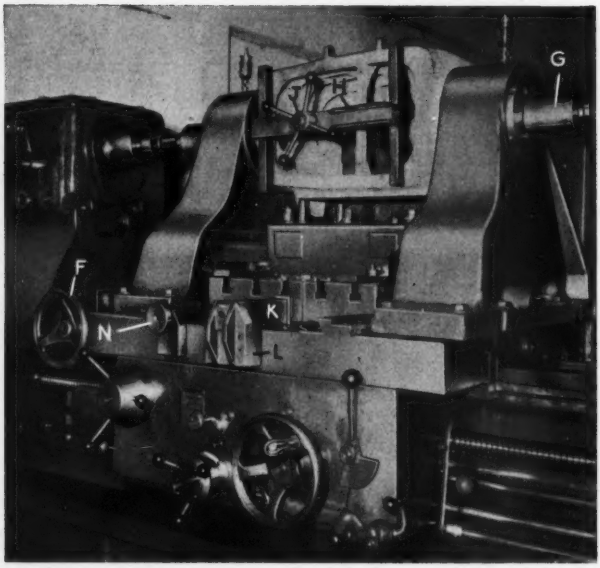


Fig. 9. Close-up view of the apron, saddle and cross-slide of the Romi special boring machine, showing the fixture with a lathe headstock in position. The cross-slide is set to suit the different bore positions with the aid of special steel blocks

operations, and rapid traverse motion can be applied by means of a feed shaft, gearing, and rack. There are eight cutting feed rates, from 0·05 to 1·3 mm. (0·002 to 0·051 in.) per rev. of the spindles, and the rapid traverse rate is 16 ft. per min. The rapid traverse motion is disengaged by means of a dog on a stop bar at the rear of the bed. This dog is engaged by any of six stop screws carried in a drum at each end of the saddle, and the drums can be indexed by means of a handle *F* at the front of the unit.

Fig. 9 is a close-up view of the apron and saddle, with a headstock for a type NTCN lathe mounted in a fixture on the cross-slide. The boring bar is supported in Timken taper-roller bearings in sleeves at each end, as indicated at *G*. These sleeves are prevented from rotating by keys in the guide bushes in the brackets on the cross-slide, but are free to slide. Bars of various types and sizes are required for boring the different components, but all have sleeves of the same external diameter, to fit the guide bushes.

The work-fixture is of the angle-plate type, and is secured and located on the cross-slide by T-bolts and tenons. Fitted to the vertical wall of the fixture are two horizontally-disposed steel bars, which are hardened and ground. The lower bar is of semi-circular cross-section and is engaged by a V-groove at the front of the bottom face of the headstock, which mates with the front V-guideway of the bed, when the unit is assembled to the lathe. Of rectangular section, the second steel bar is contacted by the flat guide at the rear of the headstock bottom face, which will mate with the rear flat guideway of the lathe bed.

When the workpiece is loaded into the fixture, it rests on pegs in the horizontal member, and a pillar, which projects from the vertical wall of the fixture, passes through it. An H-shaped member *H*, made from steel bar by welding, is placed in position, and a large capstan-type hand-nut *J* is applied to the thread on the end of the pillar. By tightening the nut on the pillar, the member *H* is thrust against the flat top face of the headstock, so that it is lifted from the pegs, and clamped, against the location bars.

The main spindle bore and a lay-shaft bore are machined with the equipment described, and it is the company's practice first to rough bore a batch of workpieces, and then finish bore. For machining the different bores, the cross-slide is positioned with the aid of special hardened steel blocks, as at *K*. A block of the correct length is mounted on the saddle, in contact with the heavy abutment bracket *L* at the front, and the cross-slide is moved transversely, through a rack and pinion motion, by the handwheel *M*, Fig. 8, at the side of the saddle, until a hardened plate on the front edge engages the block. The slide is then clamped in position by turning the knurled knob *N*, Fig. 9, which moves a tapered gib strip.

The company has recently put into operation a special-purpose machine built to their specification by Oerlikon Italiana, which provides for boring the headstocks, tailstocks, aprons and feed gearboxes for IMOR type MIN and MID lathes, also certain components for NTCN and NTPN lathes. This machine will be described in detail in the next article in this series.

Both the special Romi and Oerlikon Italiana boring machines are installed in the main machine shop of the Santa Barbara plant. This shop is laid out with the various types of machines arranged as far as possible in groups, and the tool, gauge and drawing store is located in the centre,

where it is readily accessible to all sections. In the milling section, there are large batteries of American-built Kearney & Trecker and Cincinnati machines, and the latter include a large Hydromatic for operations on lathe saddles.

HURTH PROGRAMME-CONTROLLED KEYWAY MILLING MACHINE

Equipment in the milling section includes the Hurth type KF32 keyway and spline milling machine shown in Fig. 10. This machine is set up for cutting a keyway, 20 mm. (0·787 in.) long by 5 mm. $+0{\cdot}012$ -0 mm. (0·1969 in. $+0{\cdot}0005$ in. -0) wide, in the leadscrew extension shaft for the Dialmatic feed gearbox for a type MVN lathe. A transverse movement of 0·15 mm. (0·006 in.) is employed, and with the cutter running at 1,050 r.p.m. and a feed rate of 10 in. per min., the keyway is cut to a depth of 4 mm. (0·157 in.) in 2·37 min.

On this Hurth machine, there is a shaft with 10 drums at the end of the bed (at the left in Fig. 10), which controls the longitudinal feed and rapid traverse movements, also other motions of the machine, including the indexing of the automatic dividing head that can be fitted for cutting splines. Cam plates are adjustably mounted on the drums and actuate limit switches, which, in turn, operate electro-magnetic clutches or solenoids. The drums are calibrated to facilitate adjustment, and are normally enclosed by a transparent hinged cover. In the component shown, the keyway is cut with an end-mill type cutter mounted directly in the machine spindle, and at the end of each longitudinal pass, in either direction, the cutter head is raised or lowered by a predetermined amount, to suit the width of keyway required. In consequence, the accuracy of the keyway width does not depend on the diameter of the cutter. For cutting splines, a side-and-face cutter is carried on an arbor mounted in the spindle and supported by a bearing in a bracket secured to the overarm, and climb milling is employed. The cutter is raised at the end of each longitudinal traverse, and rapidly withdrawn, after which the work is

Fig. 11. Tapping holes in the main castings for 3-point steady units on a Warner & Swasey universal, articulated arm machine with pitch control

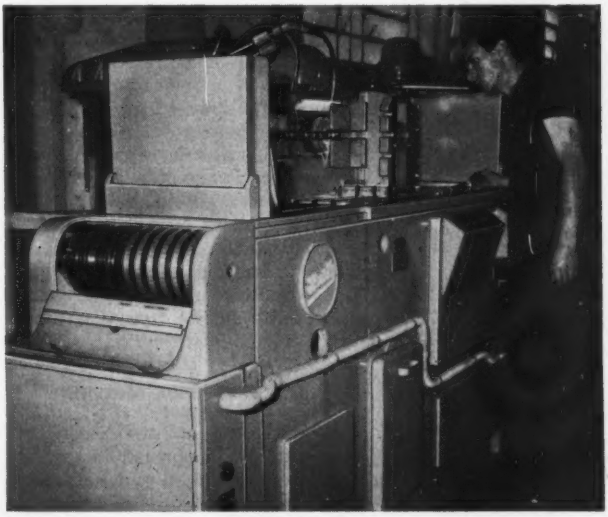


Fig. 10. A Hurth programme-controlled keyway and spline cutting machine set up for cutting a keyway in a leadscrew extension shaft for an IMOR lathe

indexed, the cutter is lowered to the preset depth, and the next longitudinal pass is started.

UNIVERSAL TAPPING MACHINE

Adjacent to the Hurth machine, there is a Warner & Swasey type No. 11 R universal tapping machine, which is seen in Fig. 11. The tapping head of this machine is carried at the end of an articulated arm, which is free to swing about a vertical cylindrical column. Thus, the tapping head can be moved to any position over the 46¾ by 28 in. horizontal working surface of the cabinet-type base, or over work clamped to the vertical working surface at the side of the base. Drive to the tapping spindle is taken from a motor that is vertically mounted above the tapping head arm, and there are four spindle speeds, from 70 to 466 r.p.m. The maximum travel of the spindle is 3⅜ in., and the maximum travel under leadscrew control, 2¼ in. In steel, threads up to ⅝ in. N.C. or N.F. can be cut, and in non-ferrous metals, up to ⅞ in.

The machine is seen set up for tapping ¼-in. Whitworth threads in three holes in each side of the main casting for the 3-point steady used with the IMOR type MIN lathe. As will be observed, the workpiece is clamped to a box-type support mounted on the machine base, and once the tap has been engaged with a hole, the operation is automatic. After three holes have been tapped in one side, the component is inverted to present the holes in the other side. The basic time allowed for this operation is 5·6 min.

SPECIAL BLANCHARD GRINDER

Extensive use is made of a large Blanchard rotary surface grinding machine for the production of flat surfaces on a variety of components for IMOR lathes. Among these components may be mentioned headstocks, saddles, tailstocks, cross-slides and many smaller parts, such as gears and covers. Fig. 12 shows the Blanchard machine, which was specially built for Romi and can accommodate workpieces with heights from ¼ to 47¼ in. It has a table of 96 in. diameter, and in the illustration, 12 headstocks for type NTPN lathes are seen in position for grinding on the top faces.

The 42-in. diameter grinding wheel is driven by a 75 h.p. motor, and comprises 10 abrasive segments. There is one wheel speed, namely, 350 r.p.m., and four table speeds, from 3 to 11·9 r.p.m. For the NTPN headstocks, the table is run at the fastest speed, and from 5 to 10 mm. (approximately $\frac{3}{16}$ to ⅜ in.) of metal is removed. Soluble oil emulsion is employed as a coolant, and the floor-to-floor time for the 12 units is 15 min. A jib crane, not visible in the illustration, is provided to facilitate loading.

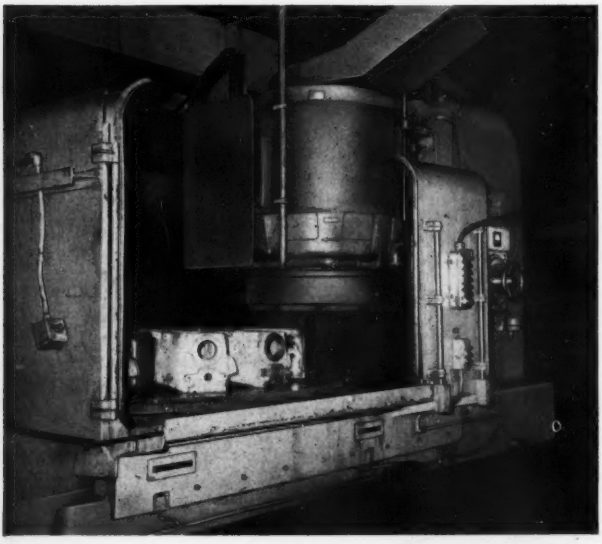


Fig. 12. This Blanchard grinding machine was specially built for the Romi company, and will accommodate work up to 47½ in. high. It is widely employed for the production of flat surfaces on a variety of lathe components

Automatic down-feed is applied to the wheel at rates from 0·004 to 0·080 in. per min., and the wheel-head can be rapidly advanced and withdrawn from the work by depressing push-buttons on the pendant panel. The head can also be traversed by hand, using the large wheel on the column, in conjunction with a dial that is graduated in divisions of 0·1 and 0·01 in.

GEAR PRODUCTION FACILITIES

As might be expected, there are good gear production facilities at the Santa Barbara works, and the largest teeth that have been cut so far are 3 d.p. The gear cutting section includes numbers of Fellows shapers, among which may be mentioned two type 61A, one type 7A and two type

615 machines, the latter being employed solely for cutting helical gears. There is also a Czech TOZ gear shaper, and a Maag shaper on which single-point and rack-type cutters are employed. Hobbing machines include a number by Gould & Eberhart and Barber & Colman. For finishing gears, the company has installed a Red Ring shaving machine, a Lees Bradner grinder, with a 36-in. abrasive wheel, for large gears, and a group of three Maag type SS-30X gear grinders, the latter being seen in Fig. 13. A large Niles (East German) machine, with a capacity for grinding gears up to 76 in. diameter, is shortly to be installed. The company has also installed an Orcutt machine for grinding shafts with splines.

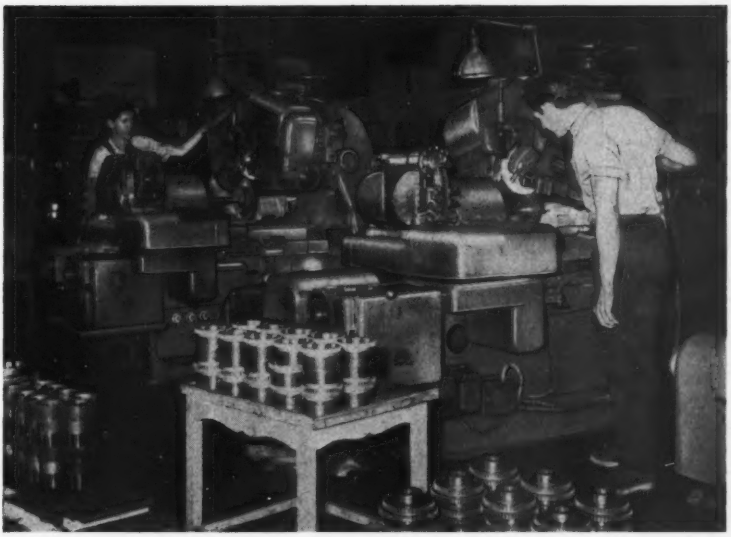


Fig. 13. View of a gear production section of the Santa Barbara works, showing two of a group of Maag type SS-30X grinding machines. All gears used in IMOR lathes are hardened to 58-62 Rockwell C

All gears used in IMOR lathes are hardened to 58-62 Rockwell C, and the manufacturing procedure generally adopted comprises rough machining, normalizing and finish machining, followed by hardening and grinding. Great care is taken to ensure the required standards of accuracy, and the first gear of each batch that is being cut is checked on an Illinois profile tester, and this check is repeated on a proportion of the gears in the batch, depending on the duty and accuracy required. Final inspection of spur gears is carried out with the aid of a Maag type DAS-2 instrument, with recording equipment, and a Maag type HM30 measuring machine is used for helical gears. Parkson-type gear testers are also employed, and it may be of interest to note that these units were built by the Romi company, to Ford drawings, when sub-contract gear production was undertaken for the latter company at the Santa Barbara works some years ago.

The company makes most of the Fellows-type cutters that are required, but standard hobs are usually purchased from outside suppliers. Special hobs are made by Romi in order to save time, and the company also makes broaches, for use on a 20-ton Oilgear horizontal machine, since otherwise these tools would have to be imported, with consequent difficulties and delays. Record cards are kept for all gear cutting and finishing tools, and form part of a comprehensive tool efficiency system that is in operation at the Santa Barbara works.

Data recorded for a Fellows-type cutter, for example, include a Romi code number, source of supply, essential details of the gear teeth for which the cutter is used, and the diameter of the cutter. Columns are provided for recording details relating to cutter servicing, including the order number, condition after regrinding, width of cutter before and after grinding, dish angle, amount of wear, and tool inspector's name. Data concerned with the work which are similarly recorded include the authorization number, part number, tooth width, batch number, quantity cut, material, hardness, and number of teeth. Data relating to the cutting operation are also recorded, including the number of strokes per min. of the cutter ram, feed rate, length of stroke, cutting speed, number of revolutions of the work, the machine code number, and the operator's number. The various entries are signed by the tool stores superintendent, the floor inspector, and the setter.

Generally similar information is recorded for hobs, rack-type cutters, and shaving cutters, so that a complete history of each gear cutting tool is always available, and the total number of teeth cut

by the tool at any time can be readily determined. A clear indication of the efficiency of each tool is thus afforded, and the design and heat-treatment of the cutters, also the cutting conditions, can be modified in the light of the recorded information, should the tool performance prove unsatisfactory.

Further articles concerned with the methods and equipment employed by Maquinas Agricolas Romi, S.A., will be published shortly in MACHINERY.

Turner Transfer Feed Unit for Presses

Developed by Turner Brothers (Birmingham) Ltd., Galvanic Works, Cliveland Street, Birmingham, 19, the patented transfer unit shown in the accompanying figure can be fitted to most types of presses and will accommodate tools up to 28 in. long, to provide for seven working stages at 4-in. pitch, for example. It can be operated by a pneumatic or hydraulic system, interlocked with the press movements, or by a mechanical link driven from the ram of the associated press, according to customers' requirements.

The unit shown in the figure is arranged for pneumatic operation, and the longitudinal motion of the two transfer bars *A* is derived from the twin cylinders *B*. These cylinders are secured to the base of the unit, and the rod ends are connected to a cast aluminium cross-head *C*. Also housed in this cross-head are the ends of the shafts carrying the transfer bars *A*, the connection being made by way of Rotax ball screws. Each nut is housed in the cross-head, and the mating screw is secured to the shaft carrying the transfer bar.

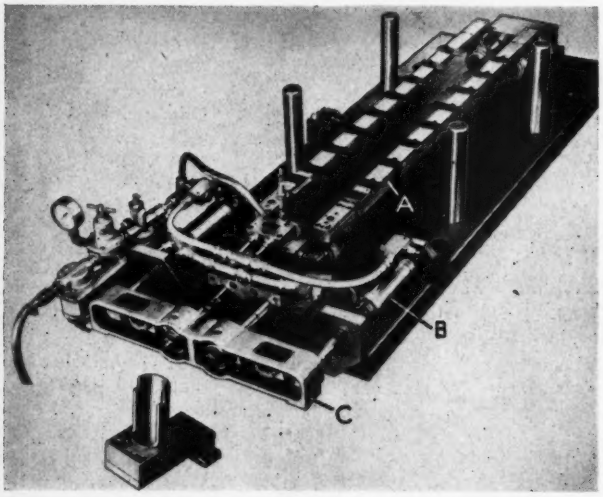
The arrangement is such that the initial portion of the movement of the cross-head serves to pivot the transfer bars, through the action of the ball nuts, and since the latter have threads of opposite hands, the bars swing in opposite directions. As a result, at the start of the feed movement the bars swing towards each other, to close on the workpieces, which are gripped by means of fingers of a suitable design. The remainder of the stroke of the air cylinders serves to move the transfer bars longitudinally as a complete unit, thereby carrying the workpieces to the next stages of the tool.

On the return movement, the procedure is reversed, the first portion of the stroke of the air cylinders serving to swing the bars away from each other, to release the workpieces. Subsequently, the bars are again moved longitudinally, as a complete unit, to the original position, in readiness for picking up workpieces at the next transfer movement of the operating sequence.

The air cylinders are provided with dampers, which operate at each end of the stroke, and the cushioning effect ensures smooth pick-up and release of the workpieces. A pressure switch is incorporated in the pneumatic circuit which stops the press in the event of a drop in pressure or failure in the air supply.

The design is such that the transfer bars can readily be removed, and replaced by others of different design, to suit various types of components, and the complete unit is easily removed, if the press is to be used for normal working.

In the foreground in the illustration can be seen a special feed magazine unit which is used in conjunction with the transfer equipment, for feeding pre-blanked discs to a press tool that is designed to carry out second operation work.



Patented transfer feed unit for presses developed by Turner Brothers (Birmingham), Ltd. It can be arranged for pneumatic, hydraulic, or mechanical operation, and will accommodate tools up to 28 in. long, to provide seven working stages at 4 in. pitch

Producing Components for Domestic Lawn Mowers

Some Examples of Moulding and Machining Practice at the Works of Ransomes Sims & Jefferies, Ltd., Ipswich

By A. W. ASTROP, Associate Editor

SOME OF THE METHODS employed for the production of medium- and heavy-gauge steel pressings for the Conquest and Sprite domestic lawn mowers, made by Ransomes Sims & Jefferies, Ltd., Ipswich, were described in MACHINERY, 98/60—11/1/61, and a second article (98/189—25/1/61) was concerned with some of the equipment installed for high-quantity induction brazing. The latter process is used extensively for sub-assembly, and is employed, for instance, for joining a heavy cast iron driving gear to a 16-gauge deep-drawn cylinder to form the land-roll for the Sprite machine. In the design of both this machine and of the Conquest, steel pressings have been substituted, in many instances, for conventional iron castings. For each machine, the bottom blade-block, is an iron casting, and these items are of a simple and straightforward design.

The only other castings employed are the land wheels for the Conquest, and the driving gear, balance weight, and pawl box for the Sprite. A large foundry, which supplies castings for the whole of the company's wide range of products, is located at Nacton—approximately three miles from the Ipswich works—and occupies part of an extensive site on which there is also a factory for the production of ploughs and combine harvesters.

MOULDING DRIVING GEARS AND PAWL BOXES FOR THE SPRITE

As mentioned in an earlier article, the land roll for the Sprite mower is an open-ended deep-drawn steel shell. Attached internally at the closed end, by three screws, there is a plain cast iron disc, which serves as a counterweight to balance the driving gear, brazed into the open end. The driving gear is in the form of a cylinder, approximately 6 in. long, one end of which is open. At the other end, there are four spokes, disposed tangentially to a central boss, and there are integrally-cast internal gear teeth. The external surface of the casting is machined to match the steel shell, but the gear teeth remain in the as-cast condition. Metal patterns are employed, and it may be noted that no draught is provided.

A close-up view of one half of the pattern, with a moulding box in position, is shown in Fig. 1. The cylindrical portion of the pattern is made from brass, in which the internal teeth are machine cut. The spokes, which are also of brass, are fitted to the centre portion *B*. Made from cast iron, the latter portion has a white-metal stripping rim, with external teeth which are a sliding fit in the internal teeth mentioned above.

In operation, the plate *A*, and the moulding box which it supports, are raised independently of the cylindrical portion of the pattern, and with this

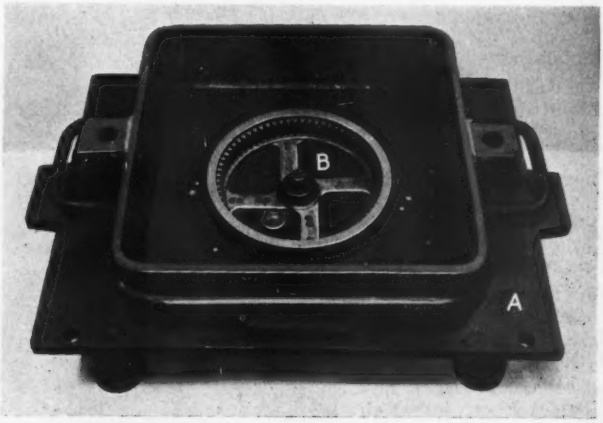


Fig. 1. One half of the metal pattern employed for making moulds for the driving gear of the Sprite motor mower. Vertically-mounted air cylinders provide for stripping the mould from the pattern, since no draught is permissible

Fig. 2. Pawl boxes for the Sprite machine are cast in groups of 11 at a time in the mould here shown

stripping arrangement a clean mould with a high quality surface finish is obtained, despite the absence of draught on the pattern. Any wear which takes place as a result of the sliding action is concentrated mainly on the white-metal stripping rim. This rim can easily be removed, and a fresh rim cast, using the machine cut teeth in the cylindrical portion as a master mould.

The mating half of this moulding equipment is simple, since it merely provides for the plain cylindrical portion of the casting.

An air-operated stripping mould is also employed for the pawl boxes for Sprite machines, and these units are cast in groups of 11 at a time. In Fig. 2 is shown one half of the mould, with a casting at *C*, and the shape of the internal driving teeth can be observed. The cast iron pattern is seen in Fig. 3, the top plate having been removed to show the construction. These pawl boxes present a difficult moulding problem, because the wall surrounding the driving teeth is comparatively thin, and no draught is permissible on the internal form. In consequence, the mould is particularly susceptible to crumbling at the stripping stage.

This difficulty has been overcome completely by the arrangement shown in Fig. 3. The plate *D* is moved vertically, by a pair of single-acting air cylinders, one of which is indicated at *E*. Flanged brass bushes, as at *F*, are attached by screws to the plate *D*, and have bores to suit the internal form of the pawl box. Within each bush *F*, there is a white metal core, as at *G*, which has the required external form and is permanently secured to the bottom plate *H*.

Reference is now made to Fig. 4, where the pattern is seen with the top plate in position, and the outline left by the moulding box is clearly visible. Screws indicated at *J* in this figure secure the moulding plate to the shouldered pillars *K*, projecting from the intermediate plate *D*, Fig. 3. In Fig. 4, air has been admitted to the twin cylinders, with the result that the plate *D* has been raised, carrying with it the patterns *F*. It will be noted that the brass bushes now project beyond the white metal cores, and in this position the mould is rammed. After this operation is completed, the supply of air is removed from the head ends of the cylinders *E*, with the result that the plate *D*, and the patterns *F*, descend. The mould is thereby stripped cleanly.

The brass bushes are made from cylindrical

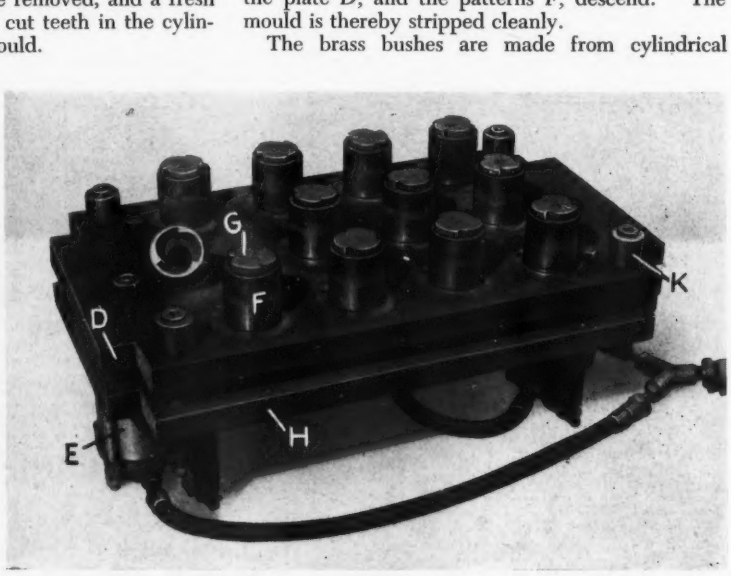


Fig. 3. The metal pattern from which the mould in Fig. 2 is made. Air-operated stripping is employed

castings, as seen at the left in Fig. 5, in which the internal form is cast approximately to shape. Subsequently, the periphery of the bush, and the flange, are machined, and the internal form is brought to the required size and shape by hand, a finished bush being seen in the foreground. The white metal plugs are cast direct from the bushes. A finished cast pawl box is seen at the right in this illustration.

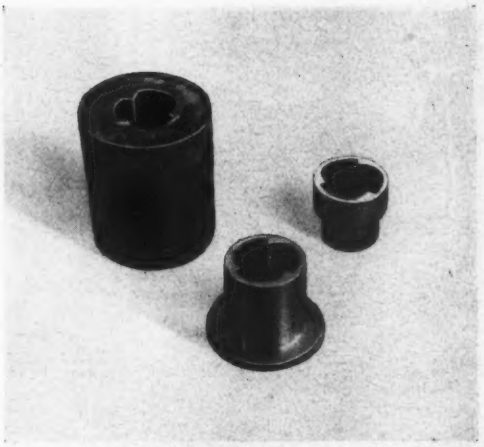


Fig. 5. In the foreground can be seen a stripping bush used in the pawl box pattern to produce a casting as at the right. The bush is machined from the brass casting at the left

INSERTING BRONZE BUSHES ON A B.S.A. AUTO

The driving gear for the Sprite mower, cast from the pattern seen in Fig. 1, is subsequently machined on various surfaces, and the operations include turning, boring, and facing on a B.S.A. single-spindle chucking automatic. This gear has a plain Oilite bush (Manganese Bronze & Brass Co., Ltd.) in the bore, and provision is made for inserting this bush during the automatic cycle on the B.S.A. machine.

A close-up view of the working zone, from the rear, is given in Fig. 6, where it will be seen that one turret face is equipped with a mandrel with a reduced-diameter portion at the outer end. In this portion, there is a transverse hole with two captive balls which are urged outwards by a compression spring. Mounted on the rear tool-slide is a vertical magazine, of channel section, and attached to the edges of the channel are two flat plates, as indicated at *L*.

These plates serve to retain the stack of bushes, and extend to the level of the penultimate bush only. The lowest bush is retained in position by means of two spring-loaded captive balls, which are housed in the platform portion of the magazine.

When the turret is in the position shown in Fig. 6, the rear slide is automatically fed inwards, towards the centre line of the machine, with the result that the lowest bush in the magazine is pushed over the free end of the mandrel. As the turret slide is withdrawn, in readiness for the next indexing movement, the bush is drawn from the magazine, transversely, and is retained in position on the mandrel by the two spring-loaded balls.

A close-up view of the turret after the next indexing movement is given in Fig. 7, where the bush is seen in position on the end of the mandrel. Successive indexing movements of the turret bring the mandrel to the working station. At this point, the spindle drive is stopped, and when the turret slide advances, the bush is pressed into the finished bore of the gear, the thrust being transmitted by means of a shoulder on the mandrel.

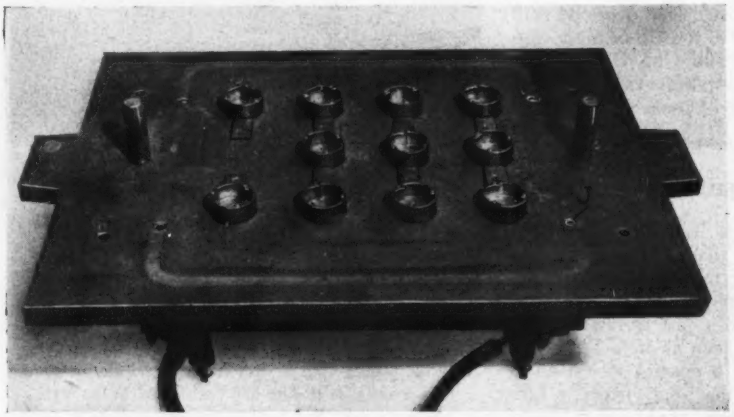


Fig. 4. In this view the mould box plate is in position over the pattern seen in Fig. 3 and the stripping bushes are raised

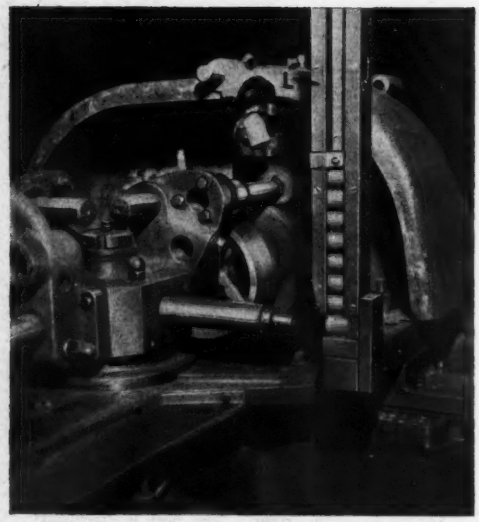


Fig. 6. This special equipment, fitted to a B.S.A. single-spindle automatic, provides for pressing an Oilite bush into the driving gear for the Sprite during the automatic cycle. A bush is removed from the magazine by a mandrel on the turret

As each driving gear is removed from the chuck it is loaded on to the simple checking fixture seen in the foreground in Fig. 7. Bolted to the end of the machine bed, this fixture incorporates a shouldered stub shaft and a free-running gear which corresponds to the final drive pinion of the mower. The driving gear is slipped over the stub shaft, which is a running fit in the Oilite bush, and the internal teeth engage with the free-running pinion. The driving gear is spun on this fixture, to ascertain whether the degree of concentricity of the cast teeth is acceptable.

DRILLING SET-UP FOR LAND-WHEELS FOR THE CONQUEST

The Conquest machine is hand-propelled, and the right-hand land-wheel has a large-diameter sprocket bolted to its outer face, whence drive is transmitted to the sprocket on the cutting cylinder. Of simple dished form, with a cast serrated tread, one of these wheels can be seen at *M* in Fig. 8, in the second stage fixture of a special set-up on a Herbert 2-spindle drilling machine. At the first stage, at the left in the figure, provision is made for drilling three holes in the web of the wheel, whereby the driving sprocket is secured, and one angular hole through the boss, which is subsequently tapped.

At the left-hand station, the wheel is loaded into a simple jig, and is supported by the plate *N*. This plate is arranged for vertical movement and is guided by four pillars. Adjacent to the fixture, and mounted on a fabricated pedestal on the same base member, there is a single-acting air cylinder *P*, with the rod extending vertically downwards. Coupled to the rod, by way of a simple toggle joint, there is a horizontal pivoted lever, the other end of which makes contact with the under-side of the plate *N*. When air is admitted to the head end of the cylinder *P*, the rod is advanced with the result that the plate *N* is raised, to thrust the work against the under-side of the bush plate *R*.

The Herbert drilling machine is fitted with a Slack & Parr 3-spindle head, and to the left of the fixture, and on the same base, there is Delta Milwaukee single-spindle drilling head, on an angular slide-base. An automatic cycle is controlled by limit switches, and the operator is required only to load and unload the fixture. After it has been drilled, the wheel is passed to the right-hand station, where the angular hole is tapped. For this operation, the wheel is slipped over a plain peg

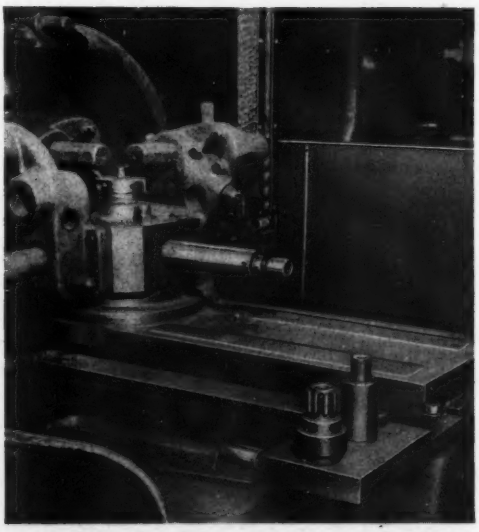


Fig. 7. In this view, the turret has been indexed after withdrawing a bush from the bottom of the magazine seen in Fig. 6. The fixture in the foreground is used for checking the concentricity of the internal teeth in the driving gear in relation to the bushed bore

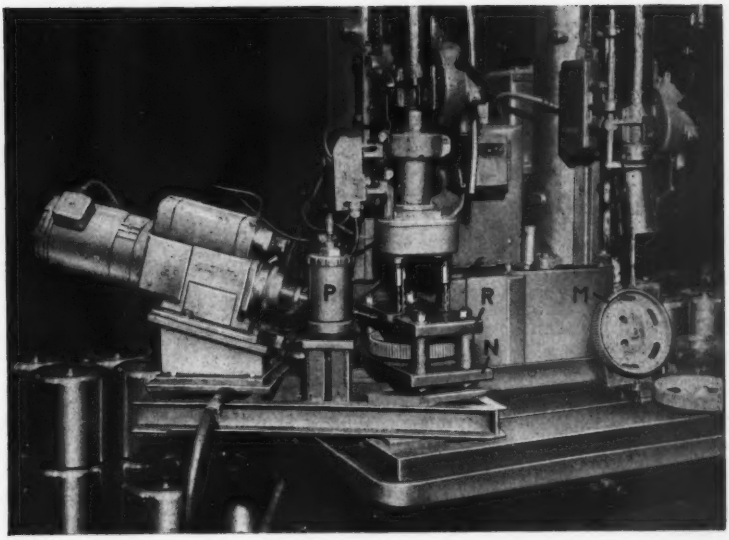


Fig. 8. This special set-up on a Herbert 2-spindle machine provides for drilling three holes, and drilling and tapping an angular hole, in the land-wheel for a Conquest machine

which projects from an angularly-disposed back plate, whereby the work is presented at the required angle.

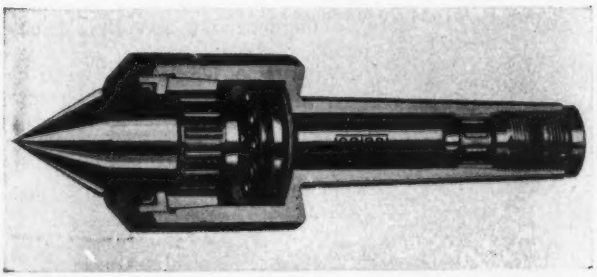
The final article in this series, to be published shortly, will describe methods for assembling and running-in Sprite and Conquest machines.

Rotor Live Centres

A NEW RANGE of live centres fitted with tungsten-carbide tips has been introduced by the Swiss firm of Rotor, for whom the agents in this country are Insley Industrial Supply Co., Ltd., 21/22 Poland Street, London, W.1. These centres, which are guaranteed to run concentric within 0·00008 in., are available in a standard series with shanks from No. 1 to No. 6, and a "super" series, from No. 2 to No. 6, Morse taper. There is also a Stabil series with No. 3 and No. 4 Morse taper shanks.

As may be seen from the accompanying sectional view, the rotating spindle extends through the shank and, in the larger sizes, is supported in two needle roller bearings with tapered outer sleeves that provide adjustment for running clearance. The two smallest sizes (No. 1 and No. 2 Morse taper), however, have plain bearings at the shank ends. Oil seals prevent the ingress of swarf and coolant.

Axial loads are carried by a heavy-duty ball thrust bearing, and the spindle is fitted with a special spring washer which takes up thermal expansion of the workpiece, and absorbs any shock loads such as may occur in automatic copying operations. All working parts are of steel, hardened and ground, and for the Stabil series, which are intended to withstand extra heavy radial and thrust loads, the bodies also are hardened and ground. All parts of the assembly which are subjected to wear during service can be replaced by interchangeable spares.



Sectional view of one of the Rotor range of live centres

In addition, type A bull nose and pipe live centres are available, for supporting tubular workpieces. The tapered spindle end of this type of centre can be fitted with either a 60-deg. pointed cone which is a press fit, or a bull-nosed 60-deg. cone, held by a screw.

Centres with B. & S., Jarno, straight, or special shanks, can be supplied to order.

Colforg Cold Forming Machines and Equipment*

Cold Forging, Ltd., 29 Hanworth Road, Sunbury-on-Thames, Middlesex, and Saarlaendische Werkzeug- und Maschinenfabrik W. Nothelfer, G.m.b.H., Lockweiler, near Saarbrueken, Germany —subsidiary companies of Camp Bird, Ltd., Camp Bird House, Dover Street, London, W.1—have introduced a range of mechanical presses, and associated machines and equipment, which have been specially designed for the production of parts in steel by cold forging. Quantity production of steel pipe fittings, and components for the electrical and motor-car manufacturing industries is being undertaken on Colforg equipment by Cold Forging, Ltd., and at the Le Vulcain, Monaco, works of International Cold Forging Corporation, another subsidiary of Camp Bird. It may be mentioned that a complete Colforg cold forging installation which was shown at the Machine Tool Exhibition held in September, 1960, at Hanover, Germany, will shortly be brought into operation at the works of Cold Forging, Ltd.

* Based on a paper presented by Dr.-Ing. H. D. Feldmann (Cold Forging, Ltd.) at the Sheffield conference on Cold Extrusion of Steel arranged by the Institute of Sheet Metal Engineering.

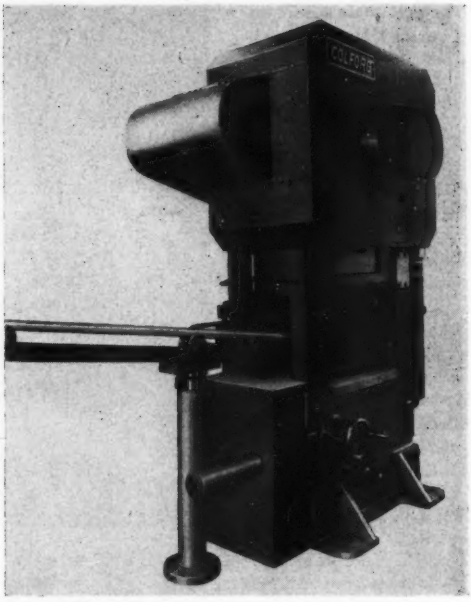


Fig. 1. Colforg cropping machine for cutting slugs for cold forging from steel bar

Auxiliary equipment in the Colforg range comprises cropping machines for producing forging slugs from steel bar, a pre-forming machine, chamfering machines, and equipment for carrying out the surface treatment of slugs. Designed for automatic operation, the cropping machine shown in Fig. 1 is made in three sizes, which have capacities for producing slugs from ¼ to 2, ½ to 4, and ¾ to 6 in. long, from steel bars with maximum diameters of 1, 2, and 3 in., and shear strengths from 12 to 42 tons per sq. in. The operating speed is 60, 45, or 30 strokes per min. depending upon the capacity of the machine.

A bar, from which slugs are to be cut, is fed automatically into the cropping head at an angle of about 7 deg. to the horizontal. The cropping blade is moved in a vertical direction, and has a semi-circular cutting edge,

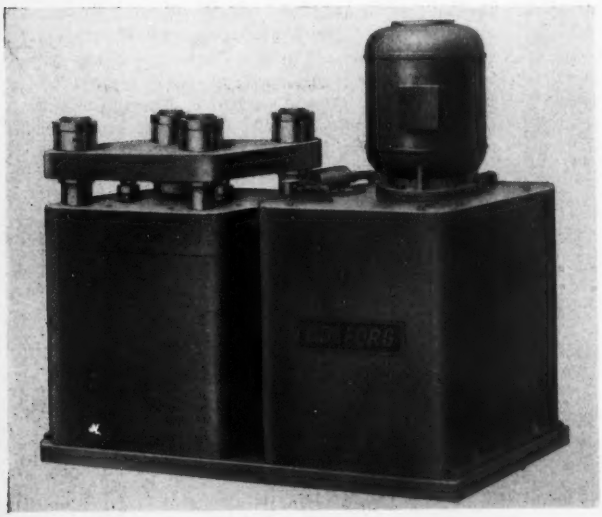


Fig. 2. Colforg machine for preforming forging slugs

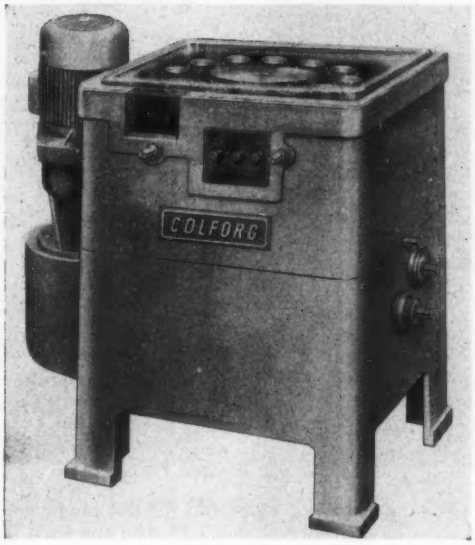


Fig. 3. This machine provides for de-burring and chamfering slugs at one end, to facilitate loading into a forging die

which partly surrounds the bar during the cropping operation. It is stated that with this arrangement, which is covered by patent No. 736,352, only a small force is required for cutting the bar, with the result that only a small amount of distortion takes place. Although the cropping blade moves at an angle to the centre line of the bar, the end faces of the pieces cut off are substantially square with the axis.

In Fig. 2 is shown the pre-forming machine, which can be supplied with hydraulic operating cylinders of different sizes to provide capacities of 100, 400, and 1,000 tons, for handling slugs of 1, 2, and 3 in. diameter. The working stroke is 0·34, 0·79, or 1·2 in., and the operating speed, 60, 45, or 30 strokes per min., depending upon the capacity. Pre-forming can be carried out between flat die surfaces, or between dies that are profiled to suit the workpiece to be produced. A combined cropping and pre-forming machine is also available, which is so designed that a slug is cut from bar stock during the beginning of the downward movement of the ram, and pre-forming is carried out at the end of this movement.

Intended for removing burrs resulting from the cropping operation, and for chamfering the slug at one end to facilitate loading into the forging die, the machine shown in Fig. 3 is made in two sizes, the smaller of which will handle slugs up to 2 in. diameter, and the larger, up to 3 in. diameter, with lengths ranging from ⅜ to 1¼ in. Chamfering is carried out by a central milling cutter of inverted-cone shape, which is driven at a fairly high speed. The slugs to be chamfered are traversed round the milling cutter by an eccentrically-mounted disc, which is positioned beneath the cutter, and is driven at a slow speed in the opposite direction. They are backed up by an outer ring of rollers, and are rotated during the chamfering operation, by the friction drive provided by the disc. Since the cutter and the rollers make contact with the periphery at three points, a chamfer may be cut on a slug which is slightly oval in plan view. The

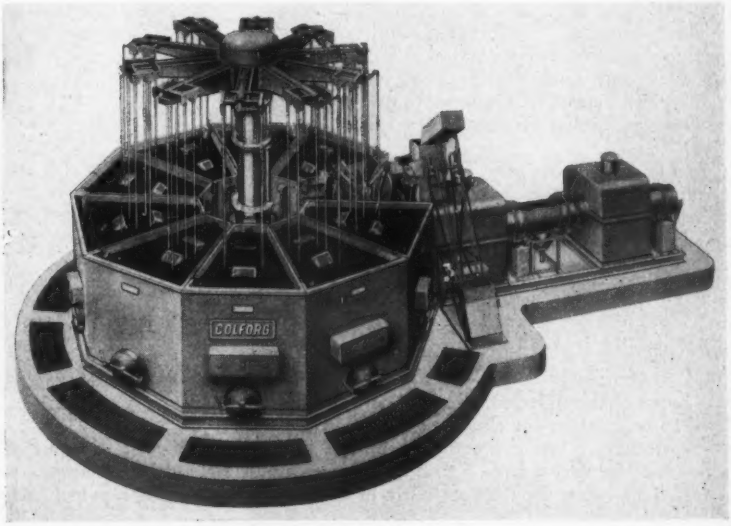


Fig. 4. A 10-station, hydraulically-operated, indexing equipment for de-greasing, pickling and phosphating slugs. A separate unit is incorporated for applying lubricant to the slugs

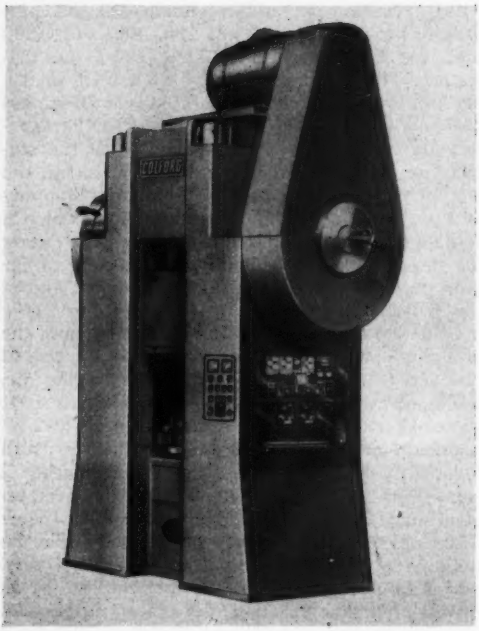


Fig. 5. A Colforg type P 302 cold forging press of 400 tons capacity

rollers can be adjusted radially, and the cutter may be set for height, to permit of chamfering slugs of different diameters within the capacity of the machine.

The cropping, pre-forming, and chamfering machines are usually supplied as independent units, but they may be linked to each other by work transfer mechanisms if required, to provide for continuous production of slugs on a fully automatic cycle.

In Fig. 4, is shown the 10-station surface treatment equipment, which provides for de-greasing, pickling, and phosphating, and for the application of lubricant to the surfaces of the slugs in preparation for forging. Batches of slugs, with total weights from 88 to 100 lb., can be loaded into baskets which are suspended by rods from the outer ends of arms attached to a central indexing unit. When loading has been completed, the baskets are closed hydraulically, after which they are lowered into baths of the different solutions, and then oscillated to ensure that the slugs are treated over their entire surfaces. At the end of a pre-set period, which may be varied from 5 to 8 min., the column is raised to bring the baskets clear of the baths, indexed, and again lowered, these motions being obtained hydraulically. In this way, the individual baskets are automatically transferred from one bath to the next. When each basket has been brought to the unloading station, it is opened, and the slugs are transferred to a screw-type conveyor built into a separate unit, whereby they are passed through a lubricant. This arrangement ensures that lubricant is applied to all surfaces of the slugs. Since an independent unit is provided for this purpose, the risk of the solutions for de-greasing, pickling, and phosphating becoming contaminated by lubricant is avoided.

Weighing about 20 tons, the equipment has overall dimensions of 23½ by 14¾ by 9¾ ft., and will handle from 666 to 1,320 lb. of slugs per hour. It can be supplied in different sizes, and without the unit for applying lubricant if the latter stage of the treatment is not required.

COLFORG COLD FORGING PRESSES

The type of press employed for the production of parts by cold forging depends upon the force to be applied to the slug and the ram travel. The maximum rate of production is restricted by considerations, which in turn, depend upon the forg-

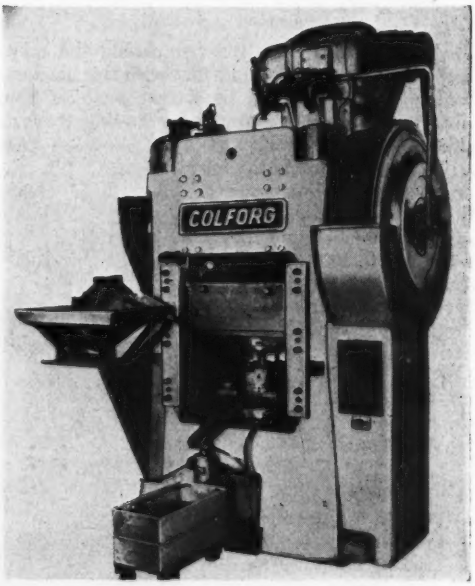


Fig. 6. A type P 300 cold forging press set up for fully automatic operation in conjunction with multi-stage tools and a hopper feed unit for slugs

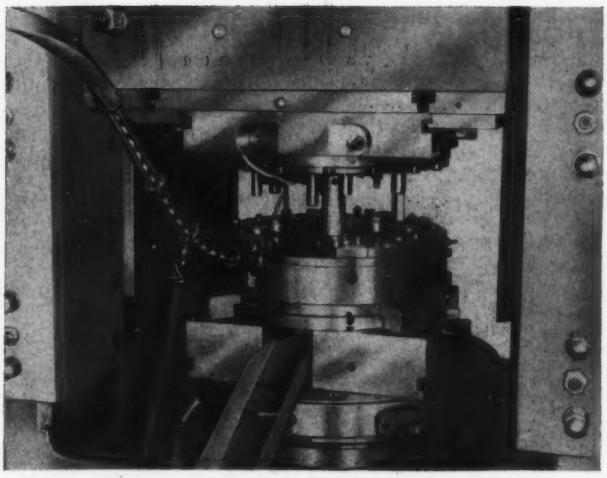


Fig. 7. Close-up view of the tooling area on the press shown in Fig. 6

ing pressure, wear, and the amount of heat generated during the working cycle. Experience has indicated that mechanical presses with ram travels up to 32 in., and working speeds from 5 to 120 strokes per min. should be used for cold forging operations involving forces up to 1,000 tons. For higher forces, mechanical presses with operating speeds from 10 to 40 strokes per min. are employed, provided that the required ram travel does not exceed 16 in. When forces up to 1,000 tons are to be applied to the work, and the ram travel exceeds 32 in., a hydraulic press with a working speed in the range from 2 to 20 strokes per min. is suitable. Hydraulic presses, with working speeds from 3 to 30 strokes per min., may also be used for cold forging with higher loads, when the ram travel required exceeds 16 in.

Mechanical-type presses in the Colforg range are available in three sizes, designated type P 300, type P 302, and type P 800, which will apply loads of 200, 400, and 800 tons during a 30-deg. movement of the crankshaft towards the bottom dead centre position. The ram travels range from 4 to 8, 4¼ to 5½, and from 11¾ to 15¾ in., and the working speeds from 60 to 90, 45 to 90, and from 30 to 60 strokes per min. depending upon the capacity. In addition, hydraulic presses of 1,600 and 3,200 tons capacity are being developed, the design of which is based on experience gained in the quantity production by cold forging of components for munitions in the U.S.A., France and Germany. Ram travels from 19¾ to 47¼ in. will be provided on both presses, and the operating speed will be variable from 3 to 10 strokes per min. on the smaller size, and from 2 to 8 strokes per min. on the larger machine.

The type P 302, 400-ton press is shown in Fig. 5. Mechanical presses in this range have cast or welded steel frames of exceptional stiffness so that they may be used to full capacity for cold forging, even when eccentric loads are applied. Drive to the flywheel is transmitted by belts, and pulleys of different diameters can be fitted to the motor shaft, to provide various operating speeds. Alternatively a 3-speed pole-changing motor can be supplied. From the flywheel, drive to the crankshaft is taken through epicyclic gearing, and with this arrangement, the torque that is transmitted is shared equally by a number of planet wheels, and the moving parts, which have high inertia, can be rapidly brought to rest at the end of the operating cycle. Of compact design, the unit is claimed to be virtually silent in operation. The crankshaft is mounted in plain bronze bearings of ample size, and motion is transmitted to the ram by a short connecting rod, which runs on ball bearings. Counterbalanced by four powerful tension springs, the ram slides in guideways of exceptional length, and can be adjusted in a vertical direction by turning a threaded ball-shaped extension piece at the lower end of the connecting rod, through worm gearing. Ejectors in the bed are operated from the crankshaft by a knuckle joint arrangement on the type P 302 press, and by a system of levers on the type P 300 press.

In Fig. 6 is shown the type P 300 press set up for fully automatic operation in conjunction with multiple-stage forging tools and a hopper feed unit for the workpiece blanks. A close-up view of the tooling area is given in Fig. 7. Blanks from the hopper are picked up by a rotating magnetic disc, and are passed by way of a chute into an insert in a disc incorporated in the die. This disc is indexed during the upward movement of the ram at the end of each working stroke, for passing a blank to the first forging station, and for moving partly-formed workpieces from one station to the next.

The type P 300 press is driven by a 20-h.p. motor, and the ram has a working stroke of 4 in., and a vertical adjustment of ¾ in. A maximum distance of 17¾ in. is obtainable between the 22- by 27-in. end face of the ram and the 23- by 23-in.

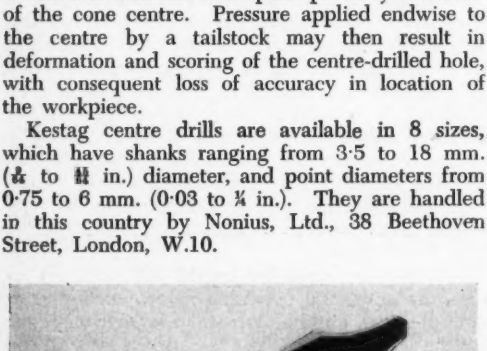
top surface of the bed. The distance between the side members of the frame is 23½ in. An ejector is fitted which is operated from a cam on the crankshaft, through an arrangement of links. Interchangeable cams can be provided for varying the working stroke of the ejector and the point in the operating cycle at which it is brought into use. The ejector can be set for height by means of an adjustable connecting piece in the linkage. A pinion can be brought into mesh with a gear attached to the flywheel, and then turned by hand with the aid of a key, for raising the ram in the event of the forging tools becoming jammed.

Kestag Centre Drill

Recently introduced by Karntnerische Eisen- und Stahlwerke, A.G. Vienna, Austria, the high-speed steel centre drill shown in the figure, is characterized by the fact that it has curved cutting edges. When a cone centre is brought into engagement with a hole produced by this drill, contact is obtained at a diameter, which is located at about half the depth of the hole.

This design avoids line contact at either the small- or large-diameter end of the hole, which results when the cone angle of a conventional centre drill does not correspond precisely with that of the cone centre. Pressure applied endwise to the centre by a tailstock may then result in deformation and scoring of the centre-drilled hole, with consequent loss of accuracy in location of the workpiece.

Kestag centre drills are available in 8 sizes, which have shanks ranging from 3·5 to 18 mm. (⅛ to ¾ in.) diameter, and point diameters from 0·75 to 6 mm. (0·03 to ¼ in.). They are handled in this country by Nonius, Ltd., 38 Beethoven Street, London, W.10.

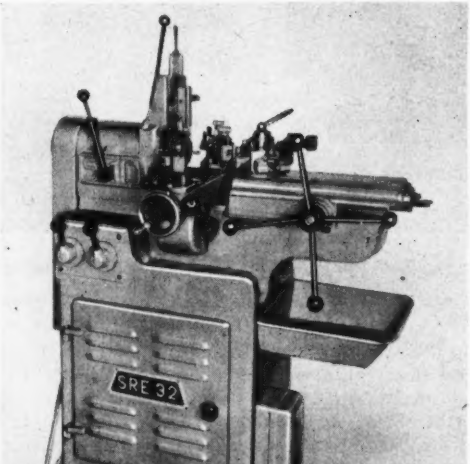


An example from the Kestag range of centre drills with curved cutting edges

Smid SRE 32 Capstan Lathe

Design improvements have been made recently to the French-built Smid SRE 24 capstan lathe and the latest machine, which is designated SRE 32, has a bar capacity of 1¼ in. diameter. The sole agents in this country are Litton's Machine Tool Co., Ltd., 372-378 Old Street, London, E.C.1.

Bored 1½ in. diameter, the spindle is hardened, and is mounted in precision taper roller bearings. Normally the spindle speeds range up to 1,800 r.p.m., but an alternative range, which extends to 2,340 r.p.m. can be provided, if required. A spindle brake can be incorporated, and provision can be made for pedal control, as may be seen in the accompanying figure. An auxiliary slide, also shown in the illustration, can be mounted on top of the headstock, and has a vertical traverse of 2¾ in. It can be swivelled, for taper turning, and can be adjusted laterally. Provision is also made for the use of a copying unit.



Smid type SRE 32 capstan lathe which has a spindle bored 1½ in. diameter, and speeds up to 1,800 or 2,340 r.p.m.

The machine can be supplied with the Silda patented, synthetic rubber-lined bar guide, which is claimed to reduce noise, also to prevent damage to the corners of square or a hexagonal section stock.

Production Engineering in a Stationery Factory

THE STATIONERY FACTORY of Spicers, Ltd., at Sawston, Cambs., until about four years ago relied on traditional methods for the production of note-books, envelopes, tag labels, printed wrapping papers and other items with a paper base. An extensive survey of the plant showed, however, that efficiency could be improved by the installation of new equipment either of standard type with modifications, or specially designed. In the intervening period, the company's engineering works at Balham, London, S.W., have provided new machinery and plant, and certain of the production methods have been changed to permit increased output.

One of the new machines which has been developed and built is illustrated in Fig. 1. It is known as the Monck blank cutter, and is employed for producing the blanks required for pocket envelopes with relatively little waste of material, in contrast to the traditional method of blanking from stacked material in a press. The Monck blank cutter is fed with paper from a reel of 4-blank width, and rotary cutters are employed for separating the material into four separate webs with interlocking edge patterns which form the flaps of the envelopes. There is thus almost complete utilization of the work material, the only scrap being the small cut-outs which are produced at the outside edges of the reel.

Alternate pairs of the separated webs pass upwards and downwards through roller feeds to a station where rotary cutters may be employed to convert the material to separate blanks of envelope size. This phase may, however, be eliminated, and the webs may be rewound on separate reels for eventual use on reel-fed "pocket" envelope machines.

A view of the machine from the delivery end is given in Fig. 1, and shows the four rewinding spindles which are driven independently by Keelavite type G 101 hydraulic motors, each controlled by a type 2605/3/500 tappet-operated relief valve, and all supplied from one Keelavite type GP 2017 pump coupled to a 7½-h.p. motor.

Hydraulic drive to the reel spindles was chosen largely on account of the facilities which it affords for maintaining a constant tension of 1½ lb. per inch of width in each of the four webs, and restricting the movement of the material to a maximum speed of 500 ft. per min. as the rewound reels build up from 6 in. to 48 in. diameter. The speed of each hydraulic motor is controlled by variations in the setting of the associated relief valve which, in turn, are governed by a cam-

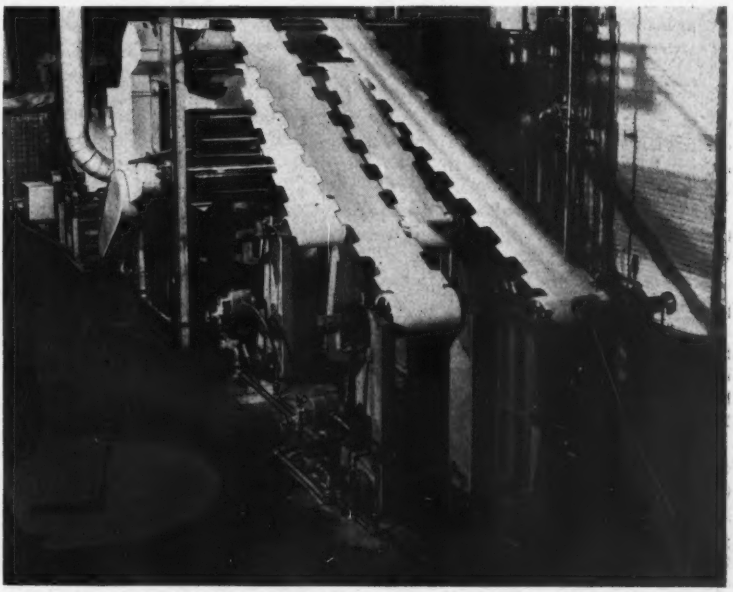


Fig. 1. The four re-wind stands of the Monck blank cutting machine are driven by separate Keelavite hydraulic motors connected to a common pump

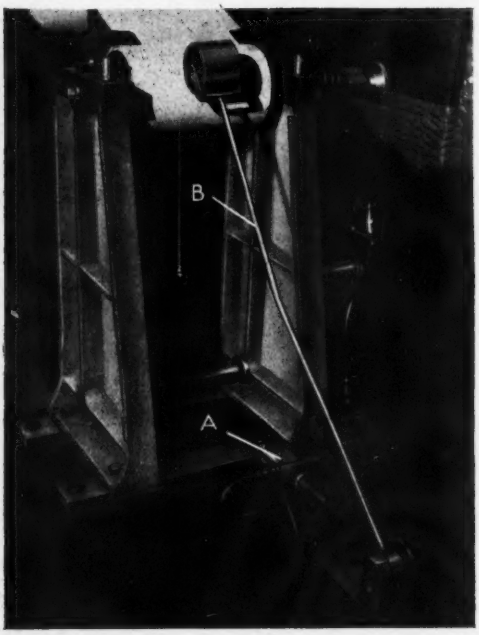


Fig. 2. A tangential feeler responds to the change in diameter of the re-wound reel and varies the setting of the control valve to limit the speed of the paper to 500 ft. per min.

operated valve *A*, Fig. 2, linked to a tangential feeler, *B*, the latter being so positioned that it is responsive to the change in diameter of a re-wound reel of paper.

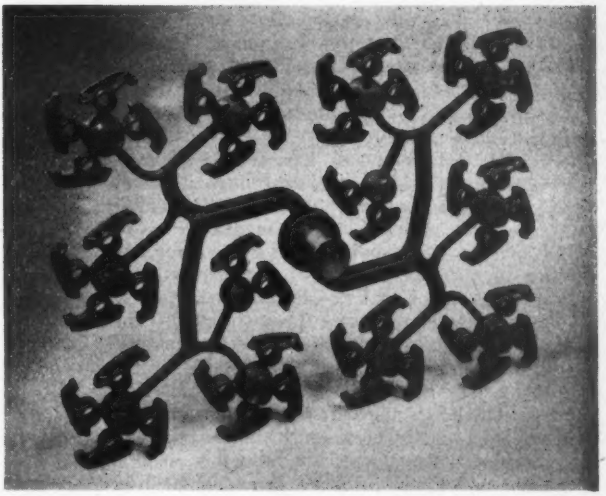
Drive from the Keelavite hydraulic motor is transmitted through reduction gearing and twin V-belts to the reel spindle. A type 6612/EJ flow control valve is provided in the pipe circuit to prevent the no-load speed of the motor exceeding a pre-set limit in the event of the paper web breaking during a reeling operation. The hydraulic equipment was supplied and installed by Hydraulic Machinery Drives, Ltd., 101 London Road, Reading, Berks.

Another special-purpose machine, which was designed and constructed by Spicers to facilitate the cutting of diamond-shaped envelope blanks, is shown in Fig. 3. Four vertically-mounted Maxam pneumatic cylinders are used, two of which, at *C* and *D*, operate shaped blades designed to cut opposed notches in the stack of paper blanks held on the work-table by a third cylinder *E*. The fourth cylinder, *F*, mounted at the rear of the table, is fitted with a curved blade which removes excess material from one corner of the blanks to produce the required form for the bottom flaps of the envelopes. Two working strokes are required to complete the notching and shaping of the blanks and during the first stage, as depicted in the figure, the three cutters operate simultaneously.

The functioning of cylinder *F* depends on a signal being received from a photo-electric cell mounted in a recess in the work-table between the wooden blocks held by the operator, and below the projecting part of the paper stack. During the first working stroke, light from a lamp situated in an adjacent recess in the work-table is reflected from the bottom surface of the stack on to the adjacent photo-electric cell, whereby the operation of the rear cylinder is controlled. When the stack is withdrawn, reversed, and again positioned under the cutters, in preparation for the second stroke, the photo-electric cell is rendered inoperative owing to the absence of a reflecting surface. This result is brought about because material was cut from the corner which is now at the front, at the previous stage. Only the side cutters are employed during the second stage, and they produce two additional notches in the edges of the stack.

Fig. 3. Special air-operated machine for notching and trimming paper diamond-shaped blanks for envelopes

Pearlitic Malleable Iron



PEARLITIC MALLEABLE IRON is now being used for the production of components that were hitherto made from steel castings or forgings, largely on account of the ease with which the material can be selectively hardened. Gears, sprockets, hubs and crankshafts are the principal applications for this material. All these components transmit motion and require to be machined, also they must possess a combination of abrasion resistance and good bearing qualities. In the unhardened (pearlitic) condition, this malleable iron has a machinability equivalent to that of dead soft cast iron and many free-cutting steels, but it can be hardened to 50 Rockwell C or higher, and the wearing qualities then compare with those of carburized steel.

The most important constituent for imparting hardness to ferrous alloys is iron carbide (Fe_3C), and the quantity, form and distribution of this constituent determines the overall hardness. In contrast to the usual ferritic malleable iron (which has a matrix that is free from combined carbon), pearlitic malleable irons contain 0·30 to 0·90 per cent of carbon in the form of iron carbide. Since this constituent can be readily caused to go into solution by a simple heat treatment, selective hardening can readily be carried out.

Fig. 1 shows a section through a rocker arm cast in pearlitic malleable iron (in a spray as seen in the heading illustration) and serves to show the possibilities of this material. The pad face is hardened to impart wear resistance, whereas the body is left soft to withstand alternating shock loads. Hitherto, it has been common practice to employ steel rocker arms, with the pad ends hardened either by flame or in a salt bath. A steel rocker arm, however, requires to be fitted with a brass or bronze bushing in the bearing bore, and the cost is therefore increased.

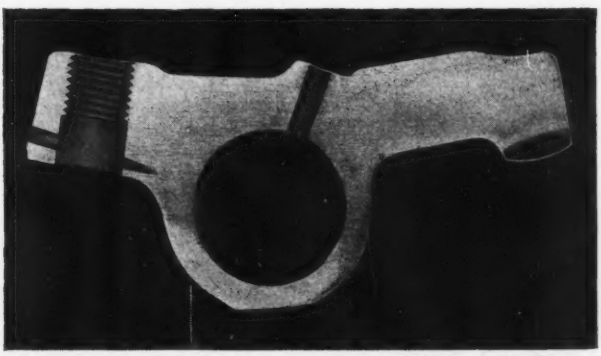


Fig. 1. Cross section of a pearlitic malleable iron rocker arm showing macrostructure after hardening the pad surface at one end (indicated by the dark area at the right)

Several motor car manufacturers are now employing pearlitic malleable iron castings for rocker arms, because, apart from the fact that they can readily be hardened locally, they have a tensile strength that is ample for the application; the bearing properties of the material avoid the need for bushing; and machining costs are lower than for steel parts. Salt-bath or induction heating can be employed to obtain a surface hardness of 50 Rockwell C to a minimum depth of 0·030 in.

The clutch hub for a motor car

transmission unit, seen in Fig. 2, is produced in pearlitic malleable cast iron for much the same reasons. This component and two others are hardened simultaneously in a single heat-treatment fixture, and it has a longer life than the part which it replaced, is lighter, easier to machine, and requires less metal removal.

For hardening pearlitic malleable iron, it is only necessary to heat and quench, and any one of a number of conventional heating methods may be employed—for example, by induction or flame, immersion in a salt or lead bath, or treatment in a furnace. Induction or flame heating is preferable when a shallow depth of case is required, but if the case depth is unimportant any convenient method can be used. Depth of case is controlled by the rate of heat input, and the degree of hardness by the duration and temperature of treatment, the rate of quenching, and any subsequent tempering.

Quenching rate is determined by the medium employed, which may be water, brine, oil, a salt or lead bath, an aqueous solution of a proprietary compound, or air. The response of the material to hardening depends on such factors as section thickness, distribution of the temper carbon, chemical composition, type and quantity of combined carbon already in the matrix, and the nature of the heat treatment. The hardening procedure should be determined by experiment, taking into account such aspects as the final dimensions required, the purpose of the component, and the metallurgy of the material.

Investigations concerned with the surface hardening of pearlitic malleable irons have been conducted at the University of Michigan, sponsored by the American Foundrymen's Society. For induction hardening, it is reported, time and power input are the controlling factors, and when they were correctly selected, satisfactory results were obtained with all the irons tested. Chemical composition, within the limits investigated, had no noticeable effect on the response of the irons to hardening. A dense pattern of finely spheroidized cementite consistently yielded the highest hardness (50 Rockwell C) to a depth of 0·060 in., over the ranges of power and time covered by the investigation. The results of the tests carried out served to show that pearlitic malleable iron is suitable for heat treatment, using conventional production equipment.

COMPARISON OF PERFORMANCE AND COST OF GEARS CAST IN DIFFERENT MATERIALS

Material	Duration of test (hours)	Load (lb.)	Cost ($)	Remarks
Grey iron	10	415	1·24	Flaking of teeth
Nodular iron	12	415	2·18	Rolling and mushrooming of teeth
Pearlitic malleable iron	72	415	1·73	No failure or sign of wear

As an example of the advantages that may be gained from the use of pearlitic malleable iron, attention may be drawn to the experience of a leading manufacturer of agricultural equipment in the U.S.A. Following numerous failures of the driving gears fitted to small tractors, it was decided to employ a cast pearlitic malleable iron gear, with teeth of a particularly strong form. The tractor is powered by a 4-h.p. petrol engine, and the part in question is a main drive gear. When this gear was made from grey iron, the teeth failed due to flaking under the severe working conditions. The gear is now made from pearlitic malleable iron of grade 60003, and is induction hardened to 55 Rockwell C, after the teeth have been machined. Sample gears were tested under working conditions for 72 hours consecutively, and showed no signs of wear or indications of failure. Comparative results obtained from test gears of different types are shown in the accompanying

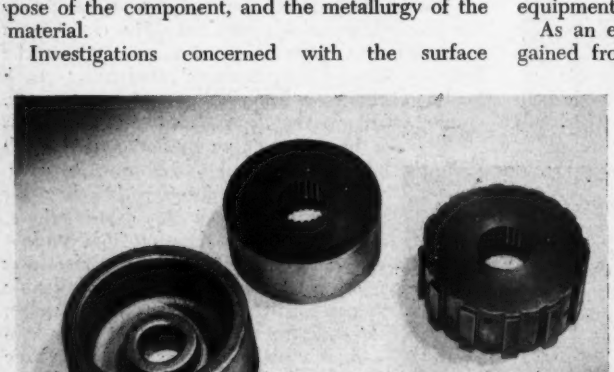


Fig. 2. Clutch hubs for motor car transmissions, made from pearlitic malleable iron, at different stages in the production sequence. A casting is seen at the left; a turned, faced, bored, and internally splined component at the centre; and an externally splined and hardened part, at the right

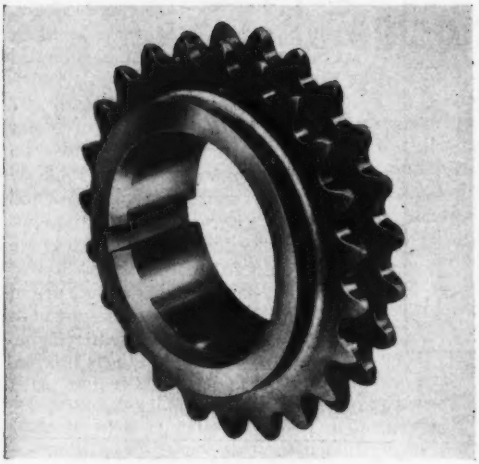


Fig. 3. Pearlitic malleable iron is employed for this motor lorry crankshaft sprocket because of its good machinability and the ease with which the teeth can be selectively hardened

table. The pearlitic malleable structure was produced in an atmosphere-controlled furnace by the arrested annealing process, and the castings were tempered in convection-type furnace. Good machinability of the pearlitic malleable iron gear, moreover, reduced production costs.

The tests carried out at the University of Michigan in connection with flame hardening pearlitic malleable iron indicated that temperature control is critical; that an increase in the manganese content of the material is accompanied by an increase in hardness and depth of case in irons of similar microstructure; that an increase in heating time results in a more uniform and deeper case; and that water quenching is necessary to obtain a hardness of 50 Rockwell C for a case depth of 0·060 in. A structure with a dense pattern of finely spheroidized cementite consistently gave the best results, and the poorest performance was associated with a microstructure made up chiefly or entirely of coarse spheroids.

A motor lorry crankshaft sprocket made from pearlitic malleable iron is shown in Fig. 3. This part was formerly machined from the solid from steel bar. After machining, the teeth of the cast sprocket are heated in an acetylene flame for 0·11 min., and quenched automatically in oil at a temperature of 90 deg. F., to produce a hardness of 55 to 58 Rockwell C. The pearlitic malleable iron sprockets have proved very satisfactory in service. Material costs are less than for steel sprockets, and machining costs have been significantly reduced.

Fig. 4 shows a pearlitic malleable iron crankshaft which is induction hardened at three positions (two journal bearings and the crankpin) in 24 sec., including the time required for transfer from one station to another. General Electric 450-k.c.s., 25-kW. high-frequency heating equipment is employed. The two journal bearings, of 0·725 and 1·017 in. diameter, are heated at one work-station and are hardened simultaneously. Operating time at the first station is 12 sec. comprising 9 sec. for heating, and 3 sec. for quenching.

The diameter of the pin is 0·767 in. and the cycle time for this portion is 10 sec., of which 7½ sec. is required for heating and 2½ sec. for quenching in water. A hardening temperature of approximately 1,600 deg. F. is employed and no difficulty is experienced in obtaining the required hardness of 54 to 58 Rockell C. A photo-macrograph of a longitudinal section through a selectively hardened area shows that the hardness pattern is in the form of a semi-elipse, with the minor axis at maximum case depth (approximately $\frac{3}{16}$ in.). The length of the hardness pattern is, of course, governed by the length of the heating coil, and the fixture is of similar design to those employed for other ferrous heating applications.

Both local and through-hardening can be carried out satisfactorily on pearlitic malleable iron components by immersion in a lead- or salt-bath at temperatures ranging from 1,450 to 1,700 deg. F. The temperature employed depends upon the type of iron, the quench rate and the intricacy of the workpiece. A hardness of 50 Rockwell C

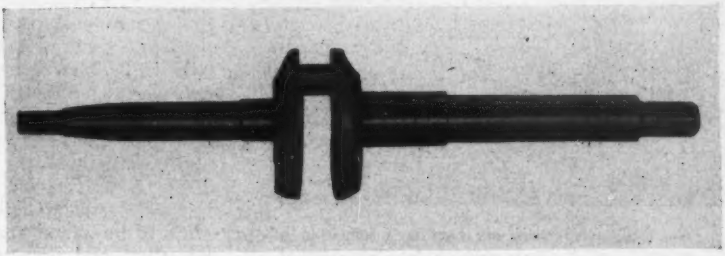


Fig. 4. Two journal bearings also the crankpin bearing of this pearlitic malleable iron crankshaft are hardened by induction heating in a 2-station fixture

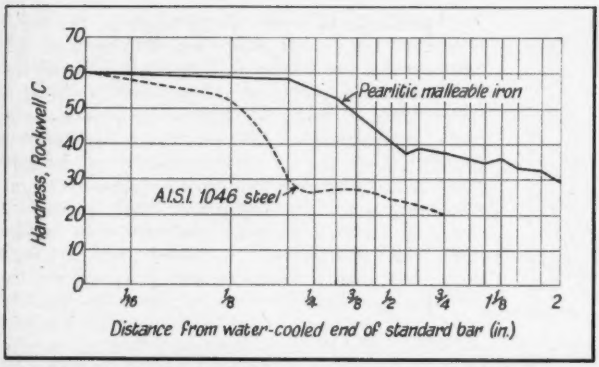
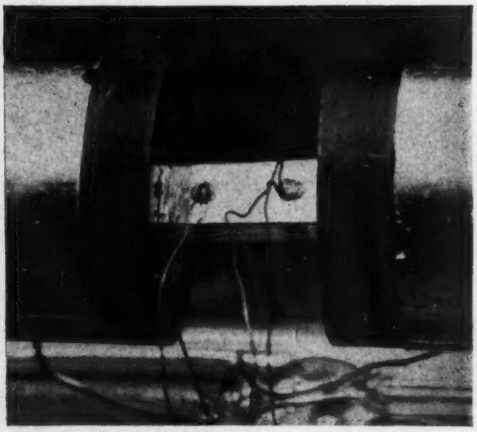


Fig. 5. The hardenability curve of end-quenched pearlitic malleable iron specimens is here indicated by a solid line, and the curve for forged AISI 1046 steel by a dotted line

minimum has been obtained by immersing samples of 1 in. thickness or less for approximately 5 min. followed by oil quenching. The original hardness of the samples was 163 to 207 Brinell. A hardenability curve for pearlitic malleable iron, shown in Fig. 5, is based on the results obtained in tests on standard end-quenched specimens. For comparison, the end-quenched, forged AISI 1046 steel are also given. In another study it was shown that hardenability curves are of similar form, regardless of the quenching method, and that pearlitic malleable iron has an end-quench hardenability approximating to that of AISI 1340, 4045, and similar steels.

Low-temperature Bonding Alloys

Investigations into the practical applications of gallium-based alloys have been carried out by the U.S. National Bureau of Standards, on behalf of the U.S. Air Force, with particular reference to the bonding of small-diameter wires to heat-sensitive electronic devices. The nature of many such devices precludes the use of solder, for joining wires and contacts, since the heat required to make this type of joint has undesirable effects on the associated components.



Small-diameter wires are here seen joined to a 0·003-in. thick silicon carbide plate by means of a gallium-copper alloy, which is soft at room temperature, but can be hardened without heating

Gallium-based alloys, however, are soft at room temperature and when allowed to harden will withstand temperatures of the order of 900 deg. C. In the accompanying figure is shown a close-up view of a silicon carbide plate—measuring 0·23 in. long by 0·003 in. thick—in position between a pair of electrical contacts. The silicon carbide plate is backed with a special glass, in order to provide the required mechanical strength. As will be seen, four small-diameter wires, of the type employed for thermo-couples, have been attached to the silicon carbide plate, and for this operation a gallium-copper alloy was employed.

The alloy is applied, to make the joint, at room temperature, and is then allowed to harden naturally, the time required for this stage varying between 3 and 24 hours, according to the composition. For one application, gold-gallium-tin alloy was employed to join thermo-couples to power transistors. Small holes were drilled in the transistors, the connecting wires were inserted, and the alloy was packed in with dental tools. Optimum results are obtained with wires between 0·01 to 0·03 in. diameter. It should be noted, however, that wires of a material which reacts with gallium—for example, gold—cannot be joined satisfactorily by this method, since they become brittle, and eventually snap.

The alloys can also be employed for cold-soldering various materials by the " sandwich " method. Parts to be joined are interleaved with a layer of the alloy, and pressure is applied until the alloy has hardened. This procedure can be used to join ceramic and metal parts.

Bullows Automatic Spraying Equipment

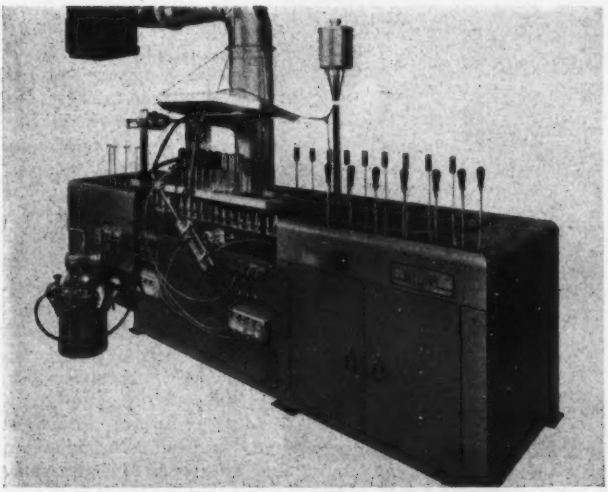
IN THE ACCOMPANYING FIGURE is shown a new conveyorized automatic spraying plant which has been introduced recently by Alfred Bullows & Sons, Ltd., Long Street, Walsall, Staffs., and provides for spray-painting parts in large quantities, on a continuous cycle. Components to be painted are supported on special holders which project vertically upwards from a conveyor chain, and the latter can be supplied with 2-, 3-, 4-, or 6-in. pitch links, according to requirements.

The chain is arranged horizontally, in a closed loop, and serves to carry the workpieces past one or more spray guns. Drive to the chain is taken from an electric motor, by way of a gearbox and a 5-step cone pulley, and adjustable cams incorporated in this transmission serve to control hydraulic valves. These valves are connected to cylinders whereby the spray gun, or guns, are moved in synchronization with the travel of the workpieces. With this arrangement, the guns are aligned with each part during the spraying cycle, and the conveyor can be maintained in continuous motion. Cams are also provided whereby the spraying time can be pre-set.

The equipment incorporates a down-draught system, whereby paint-laden air is carried down to a castor-mounted separator. This unit is provided with a system of circular baffles, and exhaust air is conveyed through ducts to atmosphere. Extra equipment available for the plant includes a mechanical device which senses an unloaded work-holder, and automatically interrupts the spraying portion of the cycle.

The standard plant is supplied with a 25-ft. conveyor chain and a 28-in. diameter driving sprocket. For workpieces which are larger than 12 in. diameter, however, a 42-in. diameter sprocket can be fitted. If required, the plant can be arranged for use with a floor-mounted conveyor, whereby the work is delivered directly from the spraying section to a stoving oven, or to an unloading station for air drying, for example.

It is stated that cylindrical components, up to approximately 4 in. diameter by 8 in. long, can be sprayed at rates between 30 and 60 per min. Larger items, about 24 in. diameter by 24 in. long, can be handled at rates between 5 and 10 per min.



The continuous conveyorized spray-painting equipment which has been introduced by Alfred Bullows & Sons, Ltd.

INTERNAL WELDER WITH TELEVISION MONITOR. An automatic welding installation for the fabrication of penstock pipes, for water-conveyance in hydro-electric schemes, is to be supplied by The British Oxygen Co., Ltd., Quasi-Arc Works, Bilston, Staffs., to Sulzer Brothers, Winterthur, Switzerland. The equipment will handle strakes ranging from 16 in. to 8 ft. diameter, in lengths up to 13 ft., and with weights up to 6 tons. It will produce all the external and internal longitudinal and circumferential welds required to close and join the pipes, and consists of three main units, namely, a fixed internal boom, a cantilever unit for external welding, and a roller-type work-support bed.

A feature of the internal welding boom is the provision at the free end of a television camera, which is connected by a closed circuit to a screen incorporated in the operator's control console. A floodlight carried on the boom serves to illuminate the working area, and remote controls are provided to adjust the camera for focus. With this arrangement, the operator can continuously observe the weld.

Producing Electric Motor Shafts on a Maxipilot Lathe with Bar Feed

By S. C. POULSEN, Associate Editor

To INCREASE OUTPUT of electric motor shafts, to meet a steadily-growing demand for their products, Wolf Electric Tools, Ltd., Pioneer Works, Hanger Lane, London, W.5, have recently installed the Maxipilot (Drummond-Asquith, Ltd.) automatic hydraulic copying lathe shown in Fig. 1. Normally, the Maxipilot lathe is arranged for chucking, but this machine has been modified to meet the company's special requirements. Non-standard features incorporated include a Birfield automatic bar feed attachment; provision for collet work-holding, with a maximum capacity of 1 in.; a special tailstock, equipped with a 60-deg. female centre; a dummy tailstock, which operates in conjunction with the bar feed attachment; and an automatic gripper, mounted on the overhead slide, for steadying the work during parting-off, and subsequently transferring it to a delivery chute.

The machine is used for producing the blanks for 13 different types of shafts, all of which are of basically similar design, and the principal dimensions and tolerances of a representative finished shaft are shown in Fig. 2. On the blank, allowance is made for subsequent grinding of the various diameters, and the material employed is En. 24 annealed bar, of ⅝-in. diameter. Originally, the blanks were produced on capstan lathes, and this procedure necessitated reversing the work end-for-end, and machining it in two stages. With this method, the total production time was 6 to 7 min. per blank, and fairly large grinding allowances were necessary, to permit correction of eccentricity that resulted from turning at two settings. On the Maxipilot lathe, the cycle time per blank is 2½ min. to 3½ min., according to the length, and since the various diameters are machined at one setting, it has been possible to reduce the grinding allowances. Typically, a blank is machined 0·007 in. to 0·010 in. oversize on the two long portions, *A* and *B*, and 0·005 in. to 0·008 in. oversize on the remainder. Concentricity is maintained within 0·001 in., total indicator reading.

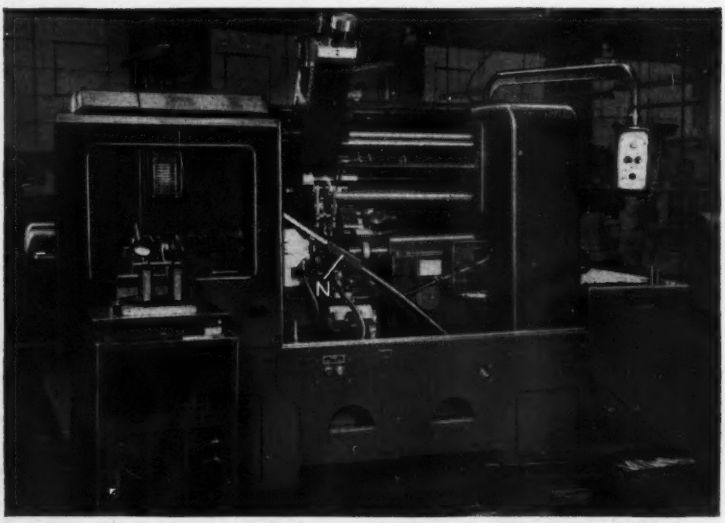


Fig. 1. This Maxipilot automatic profiling lathe (Drummond-Asquith, Ltd.) equipped for automatic bar feed, is employed for machining blanks for electric motor shafts

On the Maxipilot lathe, it may be recalled, the various motions are obtained hydraulically, and are timed and phased by an electro-mechanical system. The profiling motions are controlled by a hydraulic tracer system, the stylus of which is mounted on the cross-slide, and operates in conjunction with templates and cams on an indexing carrier. On this carrier, the templates are arranged longitudinally, and serve to control the transverse positions of the cross-slide, during the profiling and return traverse

movements of the machine saddle.

The cams, which are of the disc type, control the transverse motions of the cross-slide when the saddle is stationary, during the indexing motion of the carrier. During this latter motion, moreover, the cams serve to "lead" the tracer stylus from one template on to the next.

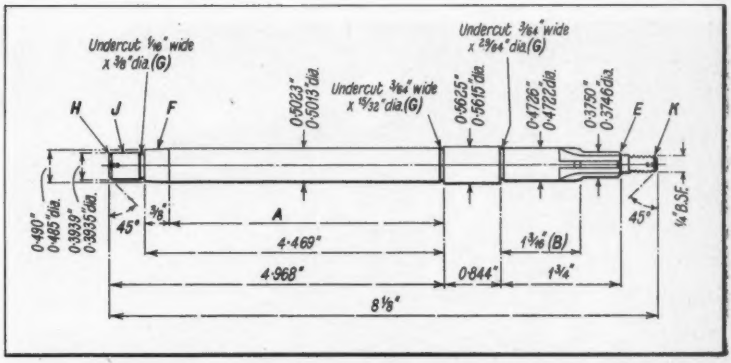


Fig. 2. Typical shaft, showing principal dimensions and tolerances. Oversize blanks, for this shaft, and 12 others of generally similar design, are produced in 2½ min. to 3½ min. each

THE AUTOMATIC CYCLE

A close-up view of the working zone is given in Fig. 3, and the automatic cycle is as follows. Initially, all tools are in the fully-retracted position, with the saddle traversed fully to the right, and the profiling tool *C* aligned in readiness to feed in and start cutting. When the collet is opened, the bar is advanced through it, into engagement with the tailstock centre, by the action of the feed attachment. This motion displaces the tailstock centre, with the result that an associated micro-switch *D* is operated. The tailstock is thereby advanced to the fully-forward position, and the bar is partly pushed back through the collet, against the thrust of the bar-feed pusher, which is driven through an endless chain and a friction clutch.

By thrusting the bar back through the collet, accurate axial location of the work is ensured, and the fully-advanced position of the tailstock is established by the end of the stroke of the associated hydraulic ram. When this position is reached, another micro-switch is tripped, and full hydraulic pressure is applied to the ram, so that the tailstock is locked. The collet is then closed, the motor of the bar-feed pusher is stopped, and the headstock spindle is run at 1,220 r.p.m. Next, the template carrier is indexed, to move the return rail clear, and to bring the first profiling template into engagement with the stylus. This motion advances the profiling tool to the work at a position corresponding to that of the shoulder *E*, Fig. 2, and the tool is then fed to the left, at 0·007 in. per rev.

Towards the end of the pass, the tool is fed straight along from the bottom of the taper *F*, Fig. 2, to machine the remainder of the shaft to 0·495 in. diameter. This cut is continued for approximately ⅝ in. beyond the end of the blank, to reduce the bar diameter. At the end of the profiling pass, the template carrier is indexed and tools at the rear of the cross-slide are rapidly advanced towards the work, and slowed to the cutting feed. Normally, this slide carries a total of four tools, comprising three undercutting tools, for producing the grooves *G*, Fig. 2, and one tool for forming the chamfer *H*. For the particular component machined at the set-up seen in Fig. 3, there are four undercutting tools, and one chamfering tool. The undercutting tools also serve to machine the shoulder faces adjoining the grooves.

Once the rear tools have been fed in to the required depth, the template carrier is again indexed, to withdraw the cross-slide towards the rear, to an intermediate position. This same indexing motion also brings into engagement with the stylus, a short return rail, over the extent of which the saddle then traverses rapidly to the right. At the completion of this movement, the template carrier is further indexed, with the result that the cross-slide is rapidly advanced, and then slowed, to feed-in the profiling tool at the undercut adjacent to the taper *F*, Fig. 2. This indexing motion brings a short profiling template into engagement with the stylus, and the saddle is fed to the left, to reduce the bearing portion *J*.

When the end of this portion is reached, the profiling tool is fed in again, to turn the 45-deg. chamfer *K* of the next component, then out, and to the left, up to the shoulder *E* (also of the next component). After reaching this shoulder, the tool is fed outwards, and along for approximately ⅝ in. Thereupon, the template carrier again indexes, the profiling tool is withdrawn, the saddle is rapidly returned to the right, and the tailstock

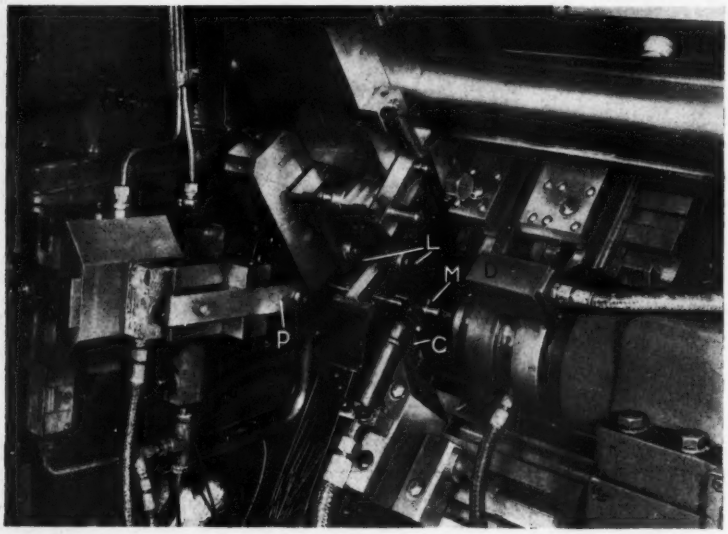


Fig. 3. Close-up view of the working zone, showing the tooling arrangements. The dummy tailstock *P* serves to locate each fresh bar, after ejection of the short end

is retracted. At the same time, the overhead slide is rapidly advanced, and then slowed to the cutting feed of 0·002 in. per rev., for parting off the work. Just before this operation is begun, two pairs of pick-off grippers *L*, Fig. 3, are advanced, and snap over the component. Each pair of grippers is provided with three steady-pads, one of which may be seen at *M*, and these pads serve to support the work. Immediately parting-off has been completed, the overhead slide is rapidly withdrawn, and the pick-off unit moves towards the front of the machine, and releases the component into the top of the tubular delivery-chute *N*, Fig. 1. The spindle then stops, the collet is opened, and the bar is advanced in readiness for the next cycle.

SHORT-END EJECTION

To provide for ejecting the short end of bar, when the latter is reduced to less than usable length, the pusher of the bar feed attachment is equipped with a spring-loaded sleeve. When, under these conditions, the pusher is advanced, the forward end of the sleeve is arrested by the back of the collet throat, and a pin within the sleeve ejects the short end from the collet as the sleeve spring is compressed. At this point, the dummy tailstock *P*, Fig. 3, is advanced into line with the collet. Meanwhile, under the control of a set of micro-switches, the pusher is fully retracted, the top cover of the bar guide is opened, and a fresh bar is lifted and rolled into the guide, from an inclined rack, by a series of fingers mounted on a common shaft. The bar guide top cover is closed and locked by a pneumatic arrangement, and at the next forward stroke of the pusher, the leading end of the fresh bar is fed against the dummy tailstock. The collet closes, the dummy tailstock is retracted, and the normal cycle of tool movements is initiated. Towards the end of this cycle, the end of the bar is reduced, as earlier described, so that, at the beginning of the next cycle, it will correctly engage the female tailstock centre.

The carbide-tipped tools employed are supplied by Penistone Hardmetals Co., Ltd., Rudyard Road, Sheffield, 6. Grade S.P. 79 is used for the undercutting and chamfering tools, and grade S.P. 76 for the profiling tool. Typically, 600 to 800 components can be produced per regrind of the rear tools, and 160 to 200 per regrind of the profiling tool. All the motions of the machine and bar feed attachment are fully protected by sequence interlock relays.

UNIT-CONSTRUCTION SPRAY-PAINTING BOOTHS. A standard unit construction system for building spray-painting booths and ovens has been developed by T.C. Spray Finishing Systems (Bede), Ltd., 5 St. James's Place, London, S.W.1, and with this arrangement, it is claimed, booths of any required width, height and length can be erected to suit existing paint-shop layouts. The system provides for building dry-back, wet-back, hot airless spray booths, and the first mentioned type can be arranged for vapour to be extracted by way of the rear, top, or end.

In addition, it is often possible to build special-purpose booths and ovens based on this system, to suit particular requirements.

NEW PRODUCTION EQUIPMENT

Edited by
G. W. Mason
and
A. J. Barker

Grimston Turret-type Drilling Machine with E.M.I. Tape-controlled Co-ordinate Table

In the figure is shown a pillar-type drilling machine which incorporates a 6-station turret head and a co-ordinate setting work-table, controlled by means of the E.M.I. punched-tape system. Designed and built by Grimston Electric Tools, Ltd., Croydon, Surrey, the machine was demonstrated at the Machine Tool Exhibition at Olympia and was set up for drilling a complex pattern of holes of different diameters, in a flat plate. The entire cycle is controlled by the E.M.I. equipment seen standing at the left, including raising and lowering of the spindle slide and indexing of the turret head.

Built by Grimston in co-operation with E.M.I. Electronics, Ltd., the co-ordinate table has a working surface of 20 by 16 in. and longitudinal and transverse movements of 10 in. These movements can be made at speeds up to 120 in. per min., to an accuracy of ±0·002 in., and to a repeatability of ±0·001 in. It may be noted that the table is fitted with Dexter recirculating linear ball bearings, to ensure maximum freedom of movement. Successive settings of the table, in both axes, can also be made by means of dials on the control console, if it is not convenient to provide a punched tape for any particular workpiece.

Grimston turret-type drilling machine with E.M.I. tape-controlled co-ordinate table

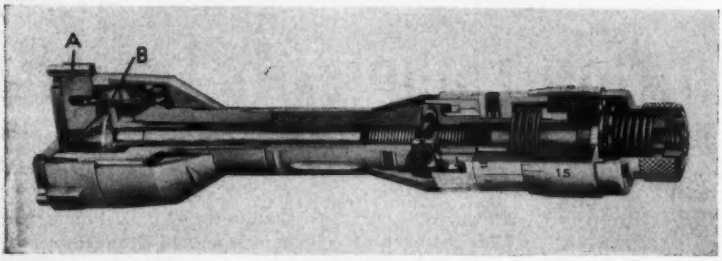
The indexing turret head is secured to the nose of the drill spindle and drive is taken by way of an adapter which fits the No. 3 Morse taper within the latter. A range of eight speeds is provided for the drill spindle, and alternative turret heads, with a maximum of seven chucks, can be provided if required.

Tesa Tri-O-Bor Internal Micrometer

Made by the Swiss company of Tesa, S.A., and marketed in this country by Matchless Machines, Ltd., 18 Bolton Street, Piccadilly, London, W.1, the Tri-O-Bor internal micrometer can be supplied for measuring diameters for 0·6 to 2·4 in. It is available as a complete unit, in six sizes, which cover the range, or for use with interchangeable measuring heads. A cut-away micrometer of the latter type is shown in the accompanying illustration.

The three rectangular-section, hardened steel measuring plungers are housed in radial slots in the head, as shown at *A*, the lower ends of these slots being closed by a hardened stainless steel end plate. Sprung arms, as at *B*, engage in blind holes in the plungers, and urge them inwards. By withdrawing these arms, the plungers are released and may then be removed and replaced by others having different forms at their outer ends, for example, for measuring the diameters of recesses, grooves of various profile shapes, and screw threads. A set of plungers for use when measuring plain holes is supplied with the instrument. Each of these plungers has a cylindrical carbide anvil pin at the outer end. Plungers are also available for checking a wide range of B.S.W., American, Unified, and metric threads.

After a fresh set of measuring plungers has been assembled, the instrument is adjusted in conjunc-



The Tesa Tri-O-Bor internal micrometer, a cut-away example of which is here shown, provides for the use of interchangeable measuring plungers

tion with a ring gauge and, for this purpose, the 0·025-in. graduations on the micrometer portion are marked on a ring which may be set to various positions after a clamping nut has been released. In use, this ring is rotated by turning the micrometer sleeve, and the graduations are observed through a small aperture. The sleeve has divisions of 0·0005 in., and further divisions, each representing 0·0001 in. are marked on the barrel. A ratchet mechanism is incorporated. Movements are transferred to the measuring plungers by a carbide, cone-shaped member, which is so mounted at the nose of the micrometer screw that it is self-aligning.

Measurements can normally be made at a maximum depth of 2·4 in. with an instrument which has capacity between 0·6 and 1·2 in. diameter, and 3 in. with the larger sizes. For measuring deeper bores, however, a 6-in. long extension unit can be supplied for use with any micrometer.

I.H.E. 2-station Induction Hardening Machine for Gears

The 2-station machine shown in Fig. 1 has recently been supplied by Induction Heating Equipment, Ltd., 11 Molesey Road, Hersham, Walton-on-Thames, Surrey, to a well-known firm of motor-car manufacturers, for induction hardening spur gears and cluster gears up to 10 in. diameter, with a maximum face width of 3 in., and an overall length of 6 in. When the work can be held between centres for induction hardening, splines up to 4 in. long, also pinions with a maximum face width of 4 in., can be handled on the machine.

A power supply at 500 volts, and a frequency of 10 kilocycles per sec., which is derived from an inductor alternator, can be supplied to the heating coils at the working stations alternately, through a system of interlocking switches, and the machine can be operated on a hand-controlled or a fully-automatic cycle. Separate transformers are provided for the heating coils, and the secondary windings have two turns, which can be connected either in parallel or in series. This arrangement, in conjunction with tappings on the primary windings, enable loads to be matched over a wide range. The inductor coil is bolted to the secondary winding of the transformer, as shown in Fig. 2, which gives a close-up view of one of the working stations.

A selector switch can be set so that the work spindle at each station is positioned either above or below the inductor coil, for loading the gear to be hardened. It is set in the lower position when a cluster gear, for example, is to be loaded, and the diameter of the coil is such that the work cannot be passed through it. When a component

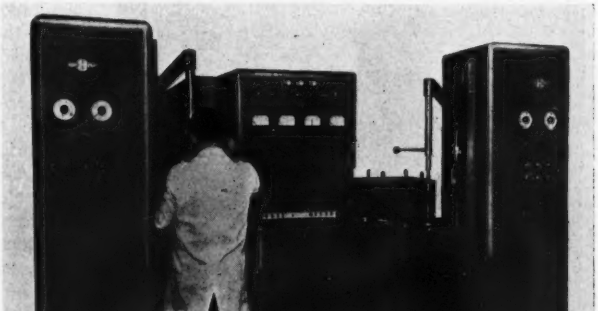


Fig. 1. A 2-station induction hardening machine for gears, built by Induction Heating Equipment, Ltd.

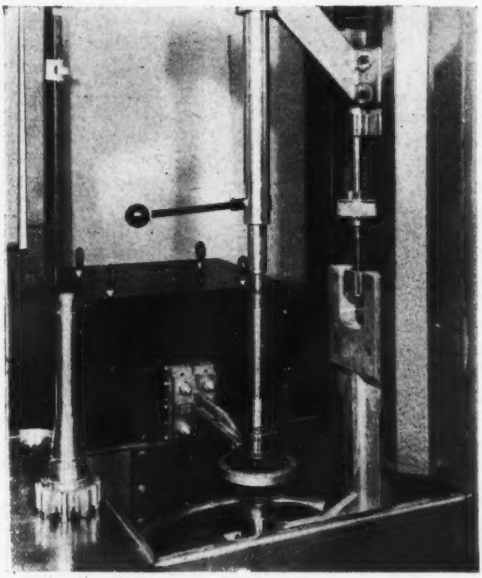


Fig. 2. Close-up view of the heating coil and work-holding arrangement at one of the induction hardening stations on the machine shown in Fig. 1

has been loaded at one station, depression of a push-button starts the spindle drive. Simultaneously, the work-head is traversed in a vertical direction to bring the work into the heating coil, and the quench tank is raised to bring the level of the fluid close to the heating coil.

Power is automatically switched on as soon as hardening of another component at the second station has been completed, and at the end of the heating cycle, which is controlled by a synchronous timer, the work-head is automatically moved downwards to lower the component into the quenching tank. Quenching fluid is delivered under pressure through holes drilled in the wall of a semi-circular pipe to provide a swirling action, which assists in cooling the work. Fluid is discharged from the tank over a weir plate, and passes through a heat exchanger, a thermostat being fitted which ensures that the temperature is maintained at a pre-set value. When the quenching operation has been completed, the tank is lowered in readiness for subsequent removal of the workpiece.

Induction hardening equipment of similar design, but incorporating only one working station, can be supplied.

De Valliere H 130 C Precision Lathe

Built by the French company M. de Vallière, S.A., the H 130 C, 5¼-in. centre lathe shown in the accompanying illustration is intended for either tool-room or production work, and will swing 5¾ in. diameter over the cross-slide and 10¼ in. diameter over the bed-ways. Work up to 12 in. diameter can be swung over a recessed portion of the bed, for a distance of 8 in. from the spindle nose, and the maximum length admitted between centres is 28 in.

Drive to the headstock is normally taken from a 2-speed, 1·3/3-h.p. motor, through a flat belt to a 4-speed gearbox. Back gearing is provided, and the system enables a total of 16 spindle speeds from 35 to 2,000 r.p.m. to be obtained. Final drive is by means of a chain, and the gearbox can be adjusted vertically, for tensioning purposes. All gears and shafts are made from nickel-chromium steel, heat treated to 400 Brinell, the gear teeth are ground, and the high-speed shafts are mounted in ball bearings.

Also of heat treated nickel-chromium steel, the spindle is mounted at the front end in a pair of Gamet Micron-precision bearings, which are adjusted to a pre-determined clearance, and a similar bearing at the rear is pre-loaded by means of a spring. The spindle is bored 1 in. diameter,

De Vallière H 130 C precision lathe

and the nose is of the standard American Camlock D 1-4-in. type, with a No. 4 Morse taper.

The same feed rates are available for both the surfacing and the sliding motions, and the quick-change gearbox provides for cutting 30 threads from 4 to 128 per in. Change wheels are supplied for cutting metric threads with pitches from 0·25 to 7 mm.

With a width of 8½ in., the bed, which is flame hardened and ground, has separate prismatic and flat ways, for guiding the saddle and the tailstock. Feed for the saddle or the cross-slide is engaged by a single lever on the apron, which is interlocked with another lever for operating the bronze lead-screw nut, and a tripping arrangement is provided whereby the longitudinal motion may be disengaged with an accuracy of 0·002 in. The cross-slide has two T-slots, whereby a rear tool-post can be mounted, and for use when screw-cutting there is a lever-operated arrangement which enables the slide to be rapidly withdrawn, for a distance of ¼ in., without altering the setting of the handwheel or the in-feed stop. The swivel-type top slide has a traverse of 4 in. A patented taper turning attachment is available, which is fitted while the machine is being built, and may be rapidly brought into operation without disengaging the cross-slide traversing mechanism.

Bored No. 3 Morse taper, the tailstock barrel has an axial travel of 7 in. and the patented mechanism enables motion to be applied either by means of a hand-wheel and a screw, or by a detachable capstan wheel, through a pinion and rack. The tailstock body may be set over ½ in. for taper turning.

A coolant system with a motor-driven pump is provided, and the electrical equipment is housed below the feed gearbox. The overall dimensions of the machine are approximately 5 ft. by 2 ft. 6 in. and it weighs 11 cwt. The wide range of special equipment that is available includes hand- and air-operated collet attachments, an indexing turret mounted on a capstan slide and a 5-position tailstock turret.

De Vallière lathes are marketed in this country by Dorman Machinery Sales, Ltd., Woodside Hill, Chalfont St. Peter, Bucks.

M.P. Internal and External Thread Cutting Tools

In the accompanying Fig. 1 and 2 are shown, in operation, external and internal thread cutting tools, of patented design, made by Mécanique & Plastique, S.A., Geneva, Switzerland, for whom the sole agents in this country are International Engineering Concessionaires, Ltd., 39 Parliament Street, London, S.W.1.

The thread is cut by means of a circular form tool with two ribs, and it is claimed that with this design the crest of the thread is finished without burrs. There are two sizes of tool for external threads, designated types 8001 and 8002, the latter being seen in Fig. 1. The type 8001 has a cutting disc of 2 in. diameter which can be supplied for cutting ANF, Acme, Whitworth and metric threads, the Whitworth threads, for example, ranging from 8 to 32 per in.

A cutting disc of 2¾ in. diameter is provided for the type 8002 tool, which is suitable for cutting coarser threads, for example, 4 per in. Whitworth. The discs may be either of high-speed steel, or tungsten carbide.

Referring again to Fig. 1, the cutting disc can be tilted up to 5 deg., to right or left, to suit the helix angle of the thread to be cut.

A grinding gauge is provided to facilitate sharpening the disc to the correct cutting angle, and there is also a setting gauge, with two location pins, for positioning the disc in the holder.

For internal threads there are four tools of the type seen in Fig. 2, which are identified by the numbers 8011, 8012, 8013, and 8014, and have discs of ¾ in., 1 in., 1¼ in. and 1⅝ in. diameter, respectively. Discs can be provided for ANF, Whitworth and metric threads. In addition, the largest tool (No. 8014) can be fitted with discs for Acme threads of 8 to 10 per in., and trapezoidal threads of metric pitches. The lead angle is set by tilting the entire head of the tool, which is of pivoted construction and is locked in position by

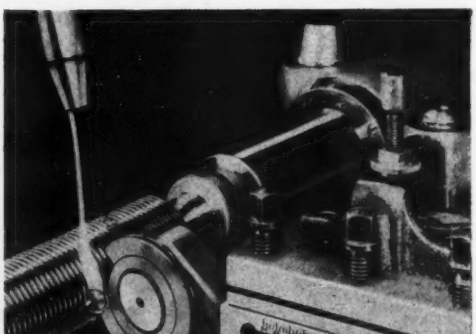


Fig. 1. Set-up for cutting an external thread with an MP circular-disc tool

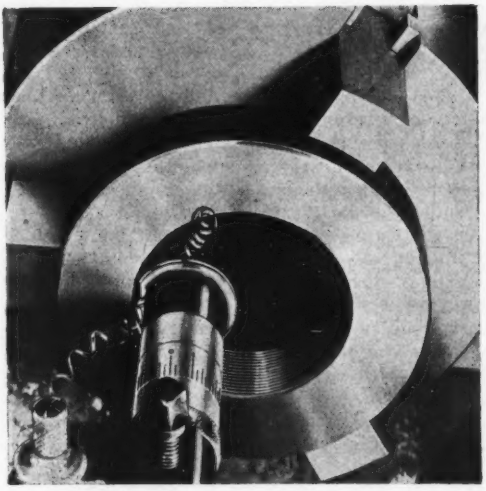


Fig. 2. MP tools of the type here shown are supplied for cutting internal threads

means of a knurled ring with a C-spanner slot. For clamping there is a socket-head screw, and gauges are provided to facilitate accurate grinding and re-setting of the cutting edge.

A special type of tool, with a ⅜-in. diameter disc, has been developed for cutting threads in smaller holes. With this design, the disc is formed on an extension piece with a taper shank, which is held in a collet fitted with a knurled cap. The arrangement for angular setting is the same as for the other internal threading tools.

Diagrit Electroplated Diamond Wheels

Electroplated diamond wheels in the new O.P.G. range that has been introduced by Diagrit Diamond Tools, Ltd., Station Road, Staplehurst, Tonbridge, Kent, enable tungsten carbide form tools to be ground without the need for coolant, and are particularly intended for use on optical profile grinding machines.

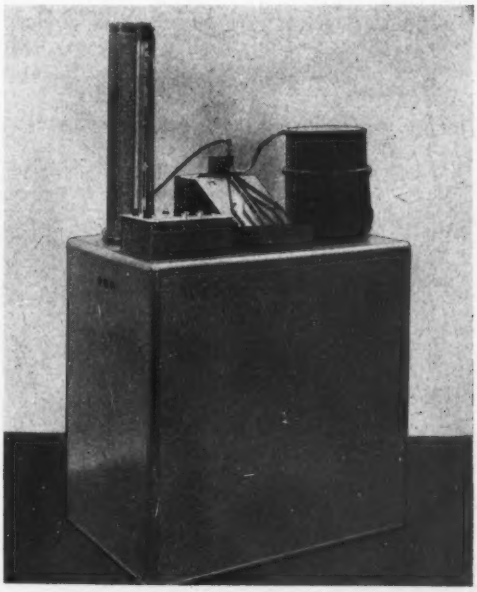
Of 5 in. diameter, grinding wheels in this range can be supplied with a semi-circular form of $\frac{1}{32}$, $\frac{1}{16}$, and $\frac{3}{32}$ in. radius at the periphery. The range also includes wheels with widths of $\frac{1}{16}$, ⅛, and $\frac{3}{16}$ in., the peripheral grinding faces of which are inclined at an angle of 5 deg. to the centre line. Wheels of this type are intended for grinding steps and recesses in the work. When they are in use, the wheel-head on the machine is usually set at a corresponding angle from the nominal position, to give a clearance for grinding a side face. It is stated that the wheels provide a free cutting action, and that the quality of the ground surface is acceptable for a wide range of work.

The bore to take the spindle adapter is held to a tolerance of +0·001, +0·0015 in. for diameter, and on the $\frac{3}{16}$-in. wide wheels there is an annular groove in one side face, and on the thinner wheels an annular step, which is turned accurately concentric with the diamond-impregnated periphery, to facilitate setting the wheel true on the adapter with the aid of a dial indicator.

Solex Cybermetric Sorting Machine

Built by Solex (Gauges), Ltd., 72 High Road, London, W.4, the Cybermetric automatic sorting machine shown in the accompanying illustration is arranged for handling rollers which have nominal dimensions of 0·310 in. diameter by 0·475 in. long. The parts are checked for diameter, and are then sorted into one of three size groups, the allowable variation within each of which is 0·0001 in., or an over- or under-size group. The operating speed is approximately 2,500 to 2,750 per hour.

Rollers are delivered by a vibratory bowl feeder to the gauging station, where each, in turn, is



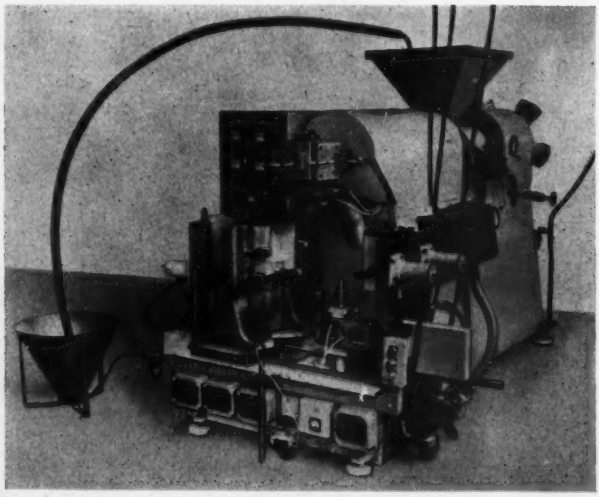
Approximately 2,750 rollers per hour are segregated into five groups, for variations of diameter, by this Solex Cybermetric automatic sorting machine

guided to a fixed datum surface. Gauging is carried out by the company's air-operated type 10M comparator unit, the probe head for which is mounted vertically above the datum surface and is pre-set. When a part from a different size category to that previously inspected is brought into position, the resultant alteration of the manometric pressure within the related air controller serves to operate limit switches of a new design, which are housed in a control unit. Deflector vanes, which are arranged at the mouths of branch chutes, are then moved into pre-determined positions in accordance with the size grading. The inspected part is now released, and is guided along the appropriate chute, into a container.

A colour scale is provided for the manometer tube, to enable the size and grading of the components to be observed, and, in addition, signal lamps are mounted on the control unit.

Amigo No. 10 Automatic Blow-moulding Machine

In the accompanying illustration is shown the Blowmaster No. 10 automatic blow-moulding machine, which has been introduced recently by Amigo Machine Co., Ltd., Skylon House, Park Royal Road, London, N.W.10, and will produce polythene containers up to 9 in. diameter with lengths up to 20 in.



Amigo No. 10 automatic blow-moulding machine, for containers up to 9 in. diameter by 20 in. long

Two moulding stations are provided, the stationary halves of the dies being clamped to vertical platens, facing each other and some distance apart. The moving halves of the dies are clamped to a platen mounted on a carriage, which is traversed between the moulding stations to close the dies alternately.

In a typical moulding operation, when a predetermined length of plastics tubing has been extruded downwards, from a die which is arranged centrally between the two stations, the extruder is stopped by a photo-electronic system, and the moulding cycle is started. Initial movement is imparted to the carriage by an air cylinder, and during this portion of the stroke, a knife attached to the moving platen cuts off the length of extruded tubing, which is subsequently trapped inside the closed mould.

Two pairs of hooks are automatically engaged during the final stage of the stroke, and the carriage is then drawn hydraulically towards the stationary platen, and the die is closed with a force of nearly 10 tons. Moulding is performed automatically, and the completed part is ejected while the carriage is being traversed to the other station.

If desired, two different containers can be produced at the same set-up provided that each requires the same length of extruded tubing, and the machine can also be operated with a single mould. As an example of the output obtainable, it is stated that containers of 3-gal. capacity, each incorporating 18 oz. of material, can be produced at rates up to 50 per hour.

Drive to the extruder screw is taken, through an Oldham coupling, from a 5-cylinder radial hydraulic motor, which is supplied with pressure oil by a variable-delivery pump, coupled to a 20-h.p. motor. The speed of the screw is steplessly variable up to 100 r.p.m. and the drive, which is supplied by Chamberlain Industries, Ltd., starts without surge, and enables the screw to be stopped within half a revolution, with the result that the length of extruded tubing can be accurately controlled.

Instruments are provided for indicating the screw speed, the extrusion pressure, and the power input to the electric motor. Temperature control equipment associated with the machine is housed in a separate cabinet, seen standing in the left background of the figure.

Physical Society Exhibition

The 45th annual exhibition of scientific instruments organized by The Institute of Physics and the Physical Society was held recently in the Halls of the Royal Horticultural Society, Westminster.

A considerable proportion of the exhibits was concerned with pure science applications and atomic physics, but there were also numerous devices of interest to engineers.

OPTICAL GRATINGS

The production of accurate optical gratings and their employment in precision metrology have been important developments during recent years, and work in this field still continues. In this connection, some equipment was shown by Ferranti, Ltd., Hollinwood, Lancs., exemplifying their transistorized moiré fringe measuring system, the fundamentals of which have already been described in MACHINERY. The essential element of this measuring system is a length of optical grating having a precisely known number of lines per unit length. When two sections of such a grating are superimposed with the directions of the lines at a slight angle to each other, a moiré fringe pattern with approximately sinusoidal distribution of density is produced at right-angles to the grating lines. When one grating moves along the other, a fringe pattern moves across the grating at a rate of one fringe cycle per grating pitch. The variation of light density produced by causing the fringes to modulate a collimated light beam is picked up on a set of four Ferranti silicon photocells, either directly, in the case of coarse gratings, or by means of a special lens and slit assembly for gratings finer than 1,000 lines per inch. The pitch of the fringe pattern is adjusted so that the mean phase of the intensity applied to each cell is at 0, 90, 180, and 270 deg., one line interval being considered as 360 deg. The antiphase pair of signals is combined in balanced amplifiers, and the output of these amplifiers consists of a pair of wave-forms in quadrature, the mean d.c. level of which is substantially unaffected by variations in grating transmission or lamp intensity.

Gratings currently in use with this system have 500, 1,000, 2,500, and 5,000 lines to the inch, and give measurements in units ranging from 0·001 to 0·00005 in. Metric gratings are also available for units of 1, 2, 2·5, and 10 microns. For circular measurement, there is a range of radial gratings from 30 min. of arc pitch on a 3·375-in. diameter to 2 min. on a 10-in. disc, which give, by the quadrature system, units from 15 min. to 30 sec.

An application of a radial grating was demonstrated by the National Engineering Laboratory, East Kilbride, Glasgow. The circular gratings used with the moiré fringe technique have been made with numbers of lines up to 32,400 and with a general accuracy of ±1·5 sec. of arc. When using identical radial scales on the input and output shafts of a machine with precision ratio reduction gears, such as a gear hobber, in conjunction with batching counters, continuous correction can be made by an additional part rotation, plus or minus, controlled by the error signal and fed into the mechanical system by means of a differential gearbox. The actual system used was described in MACHINERY 96/723—30/3/60, 96/785—6/4/60, and 96/1307—8/6/60.

A range of diffraction gratings for metrology and special sensing systems was shown by Paton Hawksley Electronics, Ltd., Rockhill Laboratories, Keynsham, Bristol.

Some interesting arrangements were displayed for the inspection of material and for the metrological examination of workpieces.

AUTOMATIC INSPECTION EQUIPMENT FOR SLUGS

Automatic equipment for the inspection of impact-extrusion slugs used in the production of collapsible tubes was included among the exhibits of Fleming Radio (Developments), Ltd., Caxton Way, Stevenage, Herts. Slugs are fed into the equipment by a rotary-disc hopper or vibratory feed bowl at a rate of approximately 200 per min. and pass along an inspection track on which there are three inspection stations—one mechanical and two electronic.

Correct orientation of the slugs is obtained within the hopper, and all slugs with gross edge defects are eliminated by way of a gap in the wall of the hopper outlet. A simple escapement arrangement spaces the slugs and ensures that they roll through the inspection stations at approximately equal velocities.

The first station inspects for peripheral protrusions. A cylindrical turbine with the axis set parallel to the track and at an adjustable distance from it is rotated by an air jet. All slugs with protrusions greater than 0·005 in. are tipped down the reject chute.

At the second station, the work is inspected for lenticular edge defects, by means of an eddy-current head. Reject slugs are blown off the track by compressed air which is electronically controlled by the out-of-balance signals produced in the head. A carrier frequency of 10 Kc/s is used to convey the information to the control circuit, and minor edge defects down to an equivalent of 5 mgm. of material missing from a slug having a nominal weight of 5 gm. may be detected.

Another eddy-current inspection head, operating at a carrier frequency of 100 Kc/s, is used in conjunction with a photo-electric gate. Unpierced and imperfectly pierced slugs, also slugs with centre hole diameters differing from nominal by ±0·010 in., may be detected. Again, rejection is effected by air blast.

MEASURING STRIP SPEED DURING ROLLING

In connection with the continuous measurement of the reduction in gauge during the temper rolling of strip, problems still remain to be solved. One method of approach is to compare the speeds of the strip before and after rolling, the increase in speed being directly proportional to the reduction in gauge. One exhibit illustrated a new method under development by the British Iron and Steel Research Association, 11 Park Lane, London, W.1. With this method, two photocells are directed on to two illuminated spots on the strip surface, the two spots being at a fixed distance apart and in line with the direction of rolling. Small irregularities in the light reflected from the strip surface give rise to a pattern in the output of the first photocell. After an interval of time, depending on the distance apart of the two photocells and the strip speed, another similar pattern is received by the second photocell. Thus, if the output of the first photocell is delayed (for example, by means of a tape recorder) and then added to the second cell signal, a maximum combined output will be obtained when the delay time introduced is equal to the time of travel between the two photocells. The strip speed can thus readily be calculated.

Tin-plate and cold-rolled strip must be inspected during manufacture for surface defects and blemishes. At high line speed, this cannot be done by the unaided eye. Bright tin-plate, however, has a high specular reflectivity with very little scatter, and when the strip is viewed at an angle a few degrees off specular, surface defects show up as bright areas in a dark field.

Equipment based on this principle was demonstrated by the British Iron and Steel Research Association, whereby, when the strip is travelling at high speed, the image of the part selected can be brought to rest by a rotating or oscillating mirror arrangement in front of a television camera.

GAUGING LONG BORES OF SMALL DIAMETER

On the stand of the Research Department of Associated Electrical Industries (Manchester), Ltd., Trafford Park, Manchester 17, was shown equipment for pneumatic gauging of small bores of considerable length. The bore is traversed by a ball-shaped probe, the diameter of which corresponds to the minimum permissible size, so that the lower limit is checked purely mechanically. During the traverse, compressed air is allowed to escape through the clearance between the ball and the bore, which serves as the supply pipe. The rate of escape of air is thus a measure of the clearance, and, consequently, of the cross-sectional area of the tube.

It may be noted, for example, that the method has been applied to the gauging of tubes 8 ft. long, with a lower limit on diameter of 0·200 in. and a maximum permissible area of $\frac{1}{4}\pi \times 0{\cdot}0208^2$ sq. in. A supply pressure of 3 lb. per sq. in. was used, and measurement to an accuracy of ±0·0001 in. on diameter was achieved under laboratory conditions.

NON-FERROUS METAL SORTER

A non-ferrous metal sorter introduced by Townson & Mercer, Ltd., Croydon, Surrey, is known as the Sortationer and permits instantaneous identification and sorting of non-magnetic metals to be carried out by unskilled labour. The instrument distinguishes between various alloys by indicating the difference in conductivity of a layer near the surface of the specimen under test.

By means of a special circuit arrangement, the head has been rendered relatively insensitive to distance, and a virtually constant reading is obtained even if it is not kept accurately square to the specimen surface, or if the surface is uneven. The head will also give constant readings when the surface has been anodized or painted, or both.

There is a coil within the sensing head which may be regarded as the primary of a transformer fed with a low ratio frequency supply, and the sample under investigation serves as a single short-turn secondary winding. The inductance of the primary coil and its losses are thus affected by differences in electrical characteristics of the samples under test.

The instrument is normally intended for identifying specific materials when distinguishing marks have been lost, or to indicate the degree of heat

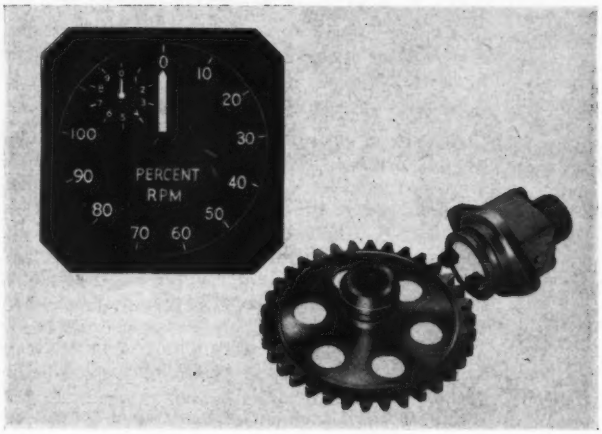


Fig. 1. Kelvin & Hughes precision tachometer which is operated from a toothed wheel

treatment. It will function with aluminium, magnesium, and copper alloys, and is reset for each basic metal. When used to check the condition of a particular alloy, it will serve as a "go" and "not go" gauge for the heat-treatment process. It will differentiate between tantalum and niobium, and between the various silver and gold alloys. A modified version has been developed for titanium.

An instrument that continuously measures the ram speeds of hydraulic extrusion presses was shown by the Cambridge Instrument Co., Ltd., 13 Grosvenor Place, London, S.W.1. It converts the varying mechanical quantity to a proportional electric current.

The measuring system is of the force-balance servo type. Current necessary to maintain balance is of the order of 0-7·5 milliamp, is independent of line resistance up to 2,000 ohms, and will operate a number of indicators and recorders in series without the need for recalibration.

Kelvin & Hughes, Ltd., Wembley Park Drive, Wembley, Middx., displayed the precision tachometer shown in Fig. 1. With this instrument, any toothed wheel of a machine or engine may be selected to produce an alternating voltage in the coil of an electro-magnetic pick-off, which is so mounted that the field of the magnet is completed by way of the teeth of the wheel. The resultant signal is fed to the presentation unit in which a voltage proportional to the input frequency is obtained.

ATTACHMENT FOR MEASURING SURFACE FINISH OF SMALL BALLS

A special attachment for the Talysurf type 3 surface measuring machine, which enables the surface finish of 1-mm. diameter balls to be measured and recorded accurately in half-millionths of an inch, was shown by the Taylor, Taylor & Hobson Division of the Rank Precision Industries, Ltd., Stoughton Street, Leicester.

The attachment, seen in Fig. 2, consists of a stationary pick-up unit in which a stylus is mounted beneath a conical seating. The ball to be tested is placed in the seating where it is rotated by a friction drive, controlled from the standard Talysurf gearbox. Surface velocity imparted to the ball is the same as is normally employed for the traverse of the Talysurf pick-up in its conventional form. Consequently, both graphs and average readings can be obtained from the standard Talysurf 3. The

Fig. 2. With this attachment for a Taylor & Hobson type 3 Talysurf, the surface finish of a ball as small as 1 mm. diameter can be measured

range of the attachment is from 1-mm. to 1-in. diameter balls, and the graph readings may have magnifications up to 50,000×.

Another exhibit was the new model 105 Talysurf, which will measure the surface finish inside cylinders of ¼-in. diameter to a depth of 10 in. This portable instrument is intended for a wide range of workshop and inspection applications and provides centre-line average reading with 0·03 in. cut-off.

A magnetic shaft-speed transducer has been developed by Ericsson Telephones, Ltd., Beeston, Nottingham. It is arranged for mounting in a 1-in. diameter hole, connections to the output being by a Belling-Lee type L789/FP plug. It is installed with a small gap between the transducer pole pieces and the rotating shaft, and any adjacent ferrous "irregularity" of the shaft, such as a keyway or bolt head, produces a corresponding pulse in the output circuit. These pulses can be fed to a suitable electronic counter with or without amplification, as required. By the use of a time-gated counter, the transducer may be employed as a direct-reading tachometer.

A type S.A.507 analogue tachometer was shown by Racal Instruments, Ltd., Western Road, Bracknell, Berks. This fully transistorized instrument may be battery or mains operated. It may be used in conjunction with a photoelectric or magnetic probe to provide a direct reading of shaft speeds up to 30,000 r.p.m., with an accuracy within ± 2 per cent.

An interesting development in the field of microscopy is the Zoom stereoscopic microscope exhibited by W. Watson & Sons, Ltd., Barnet, Herts., a member company of the Pye Instrument Group. In this instrument, a single large-diameter objective is employed to give a constant working distance of 3·5 in. Twin optical systems within the body function on a Zoom principle and provide a continuous range of magnifications over a range of 5:1. Although the axes of these systems are parallel, the eyepiece tubes are divergent to permit comfortable viewing by the operator over prolonged periods.

The examination of thin metal foils by transmission electron microscopy is an increasingly important metallurgical technique. For some applications, possibly the only way to prepare foils sufficiently thin to enable the detailed submicroscopic structures to be observed is by cutting them with an ultra-microtome. An instrument for this purpose is the Huxley ultra-microtome shown by the Cambridge Instrument Co., Ltd. It is fitted with a diamond knife, and the advance mechanism is entirely mechanical. Force for the cutting stroke is provided by gravity, and the rate of fall past the knife can be adjusted to give the best speed for any type of specimen. It is stated that sections of metal down to 100 mμ can be cut successfully.

ELECTROLUMINESCENT PANELS

A range of electroluminescent panels was shown by the Ericsson Telephones, Ltd. These panels are constructed by sandwiching a special phosphor between two conducting layers, one of which is transparent. When an alternating voltage is applied across the conductors, the phosphor emits light, which is visible through the transparent layer. The light is produced in the phosphor when the voltage is reversed and electrons return to atoms from which they were removed by the high field that existed at the preceding peak of the cycle.

The two types of luminescent panel shown are known as Phospholites and Phosphotrons. The former are intended for applications requiring a flat cool surface with an overall even brightness. When such a panel is operated from a 240-volt. 50-cycle supply, the luminous intensity is satisfactory for operation at night, or in areas of low light level. Certain types of Phospholites may be run at higher frequencies than 50 c.p.s., and the light output is then increased in proportion to the frequency.

One application of the panel type of lighting is to alphabetical and numerical display. For this purpose the liminescent material is arranged in a pattern consisting of portions that can be switched on separately, the combination of portions selected constituting a letter or a number.

Some new types of ceramic electroluminescent panels were exhibited by Thorn Electrical Industries, Ltd., Great Cambridge Road, Enfield, Middx. These panels were of the ceramic-on-glass type, and the same technique can be used for preparing photoconducting cells and other photosensitive devices, examples of which were shown and demonstrated.

The development of devices dependent for their operation on solid-state physics has enabled the size of electronic components to be reduced, and the solid-circuit semiconductor networks represent perhaps the greatest advance in electronics technology since the discovery of the transistor itself. These networks are formed by the selection and shaping of conduction paths on and through semiconductor wafers, and it is claimed that equivalent component densities ranging from 5,000,000 to 50,000,000 per cu. ft. can be obtained. On the stand of Texas Instruments, Ltd., Dallas Road, Bedford, was shown a circuit, operating as a "flip-flop", which measured ¼ by ⅛ by $\frac{1}{32}$ in. approximately, and had a functional perform-

ance identical to that of a conventional unit containing two transistors, four diodes, six resistors and four capacitors.

Another working demonstration of 13 solid-circuit networks performed the functions of a full serial adder. This arrangement measured approximately ¾ by $\frac{7}{16}$ by ¼ in. and replaced 85 conventional components.

Languepin Spark Erosion Machines

Spark erosion machines in the range made by La Soudre Electrique Languepin, Paris, were demonstrated recently at the premises of Solar Weld Languepin, Ltd., Fulledge Works, Burnley—a company which has been formed for marketing these machines in the United Kingdom and the Commonwealth.

There are three machines in the Languepin range, known as the Seleromat A, the Seleromat B, and the Seleromic. In addition, a spark discharge generator, and a filter unit for removing metal particles from the dielectric fluid, can be supplied. The Seleromat A machine, which was described in MACHINERY 93/1355—10/12/58, has a 20- by 25-in. T-slotted work-table that will support components weighing up to 1 ton. Of 100 gal. capacity, the tank for the dielectric fluid is housed in the welded steel base, and—as for other machines in the range—it is raised and lowered electrically. With the tank in the raised position, the table, workpiece, and electrode, are immersed in the fluid, and the level is automatically maintained at a predetermined height. An interlocking system is incorporated which ensures that the spark erosion operation cannot be started unless the electrode has been immersed in fluid. An advantage of this arrangement is that when the tank has been brought to the lowered position, large workpieces can be easily placed in position on the table.

The spark erosion head is mounted on an articulated arm, which can be traversed on a cylindrical column by a telescopic screw driven by worm gearing, and secured in the required position by lever-operated clamps. Since the arm can be swivelled on the column, the spark erosion head can be swung clear of the table area, to give an uninterrupted space for loading and unloading workpieces. The head has a maximum vertical travel of 4 in. on V-shaped guideways, under servo control, the drive being taken from a split-field d.c. motor, through a speed reduction gearbox and a screw. Down-feed movements can be controlled by electrical trips, which can be set to an accuracy of 0·001 in. with the aid of a micrometer scale, for "machining" holes to predetermined depths. Push-buttons are mounted on the front of the base for controlling movements of the spark erosion head by hand. The electrode holder mounted on the lower end of the head is electrically insulated, and provision is made for fitting an attachment whereby vibrations of 0·0005 in. amplitude can be imparted to the electrode at a frequency of 50 cycles per sec., to assist in removing metal particles from the working area.

The Seleromat B spark erosion machine, illustrated in Fig. 1, is of basically similar design, except that the erosion head is mounted on precision co-ordinate slides, and can be traversed through distances of 12 in. longitudinally, and 9 in. transversely, by means of screws fitted with micrometer drums, which give readings to 0·001 in. If required, illuminated optical equipment can be provided, to permit setting to a higher accuracy.

In Fig. 2 is shown the Seleromic spark erosion machine, which is the smallest size in the range, and is intended for bench mounting. It incor-

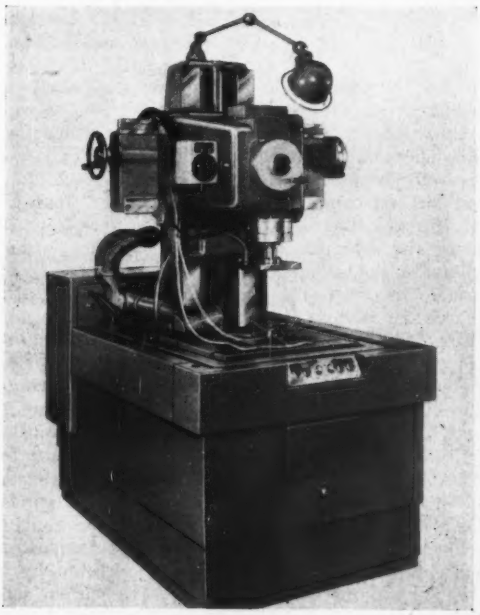


Fig. 1. Seleromat B spark erosion machine from the range made by La Soudre Electrique Languepin

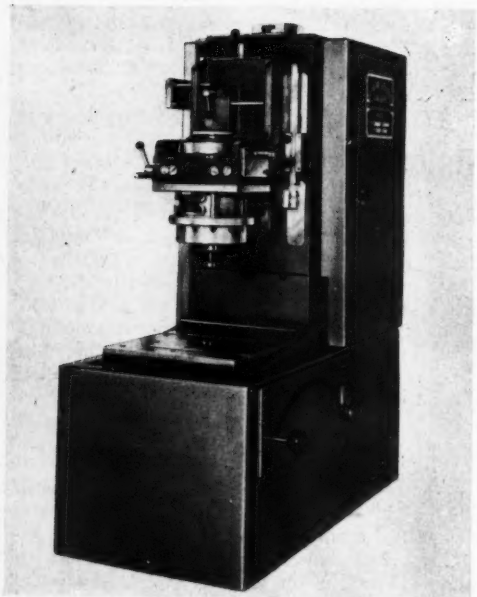


Fig. 2. Seleromic bench-mounted spark erosion machine

porates the various design features provided on the larger sizes.

Intended for operation with the Seleromat A and Seleromat B machines, the spark discharge generator occupies a floor space of 55 by 28 in., and has an overall height of 83 in. A built-in single-phase alternator, driven by a synchronous motor, provides an a.c. supply, and the output voltage is controlled and fed to a bridge rectifier circuit. Positive pulses from the rectifier serve to charge one of four banks of capacitors, which are discharged between the electrode and the workpiece during the spark erosion operation. The voltage across the spark gap is integrated and compared with a reference voltage, and any difference between these voltages is transmitted to a push-pull amplifier. Signals from the amplifier serve to control the servo motor in the spark erosion head, to maintain the spark gap at a constant value. Different down feeds for the erosion head can be selected by means of a heavy-duty 4-position switch built into the generator, which is operated by a lever in conjunction with a gate. The various setting positions for the lever are marked "roughing," "semi-finishing," "finishing" and "super-finishing."

When spark machining a 2¾-in. diameter hole in a steel component, heat treated to a hardness value of 56 Rockwell C, on a Languepin machine fitted with a copper electrode, the rates of metal removal for the selector switch settings are 0·06, 0·0085, 0·00055, and 0·00012 cu. in. per min., and the corresponding dimensional tolerances which can be maintained are 0·004, 0·003, 0·001, and 0·0003 in.

The filter unit will handle dielectric fluid at the rate of 11 gal. per hour, and provides for the removal of particles in sizes down to 1 micron. It has a total of 19 cylindrical filter elements built up from paper discs, and there are separate pumps for handling contaminated and filtered fluid. The unit will take a maximum of 66 gal. of fluid.

Management Decision Seminar

The Willesden and Hendon Productivity Association, in co-operation with Hendon Technical College, will stage a management decision seminar on March 22 and 23. This seminar, which will be held at the College, is intended to set executives in a simulated competitive environment in order that they may observe the effects of business decision-making by personal participation. Key factors in the success of such exercises are the extent to which the simulated situation approaches reality and the degree to which success depends on the skill of the participant. Those attending will take the role of executives in management teams in a highly competitive industry. Decisions to be made will be concerned, for example, with pricing, output levels, sales forecasting and allocation, stock levels, financial control, investment policy and the organization of the management structure.

Industrial and commercial organizations are invited to nominate members of their staff for this seminar, which will be limited to 20 people. Full particulars can be obtained from Mr. G. E. Wheeler, Hendon Technical College, Hendon, London, N.W.4.

Annotated Metallographic Specimens

To meet the needs of lecturers concerned with the teaching of metallurgy in educational establishments, for a source of supply of micro-specimens of known composition and structure, a collection of annotated metallographic specimens has been produced by Metallurgical Services, Reliant Works, Betchworth, Surrey. At present, this collection comprises 139 individual specimens of various alloys, which are briefly described in a data sheet obtainable from the company.

It is stated that there has been a heavy demand for specimens from colleges and universities in the United Kingdom, also from Commonwealth countries. In addition, specimens are being ordered by industrial firms with metallurgical laboratories, for reference purposes.

Sets of specimens now available include, for instance, 10 of cast aluminium alloy; 13 of specially prepared grey and white cast irons; 7 of malleable and spheroidal graphite irons; 10 of cast and wrought copper specimens; 16 of brasses; and 16 of carbon and low alloy steels.

NEWS OF THE INDUSTRY

Leeds and District

FUTURMILL CONVERSIONS, LTD., 23 The Calls, report a statisfactory increase in the volume of enquiries and orders received for the Futurmill planer/miller conversion unit. We are informed that a number of these units is now installed in various heavy engineering shops in the United Kingdom, and that an export department is being organized. Recent shipments of the units have been made to India and South Africa.

HAYES ENGINEERS (LEEDS), LTD., Gelderd Road, are busy with the production of their range of Diemaster, Tracemaster and Tapemaster milling machines, also hydraulic copying units of various types for application to machine tools. We are informed that during recent months there has been a substantial increase in the volume of orders received and that approximately 33 per cent of current business is for export. Australia, Spain, and various other Continental countries are the most prominent overseas customers at present.

A Tracemaster 43 machine, which has recently been completed, has been equipped for the production of turbine blades, and is shortly to be shipped to Holland. We hope to publish details of this machine in a future issue.

GREENWOOD & BATLEY, LTD., Albion Works, report a continued demand for their range of standard and high speed cold forging machines. Work in progress includes cold heading machines of transfer and other types, thread rolling machines, hot forging machines, and screw presses. Among special equipment may be mentioned a unit, designed on the basis of the screw threading machine, for straightening motor car valves, and a drawing machine for small tubes.

CROSTHWAITE FURNACES & SCRIVEN MACHINE TOOLS, LTD., York Street Ironworks, report a steady call for ingot and billet breaking machinery, plate rolling machines and plate-edge planing machines, and an increase in the volume of orders for wheel making machinery for the motor car and commercial vehicle industry. We are informed that a new design of wheel rim machine is at present being developed, the prototype of which will be built later this year.

New plant recently installed in the works includes a Graffenstaden 4½-in. spindle floor type boring machine complete with a 10-ft. by 7-ft. indexing table unit.

ARMSTRONG (LEEDS), LTD., Burton Street, Dewsbury Road, are experiencing a steady demand for their range of products which includes honing and lapping machines, automatic band-saw milling machines, cylinder honing machines ranging up to 60-in. stroke, hydraulic equipment, and presses up to 500 tons capacity.

SAMUEL DENISON & SONS, LTD., Hunslet Foundry, Moor Road, inform us that there is an unparalleled demand for their range of weighing and testing machines and equipment, which includes tensile and universal types ranging up to 50 tons capacity, high temperature creep and stress-rupture testing machines, rope and chain testing machines up to 200 tons, and concrete cube and beam testing machines.

Work in progress includes the recently redesigned, 1-ton capacity, type T.47.E. high temperature creep and stress-rupture testing machine, which has a normal temperature range of 450 to 900 deg. C. and is available with a 7-in. or 25-in. long furnace, the lengths of the constant temperature zones being 3 in. and 13 in., respectively.

Recent additions to the plant includes a Dean, Smith and Grace centre lathe, a Herbert No. 7 capstan lathe, a Richards boring machine, and two Ward No. 7 combination turret lathes.

FAIRBAIRN LAWSON COMBE BARBOUR, LTD., Wellington Street, are maintaining a steady output from all departments. Work in hand at present includes turning, boring, and the cutting of helical and spur gears up to a maximum of 20-ft. diameter, contract machining and assembly of various types of equipment to customers' designs, and the production of the company's ranges of shell moulding machines and textile machines and equipment.

NOEL PATON, LTD., Mabor Works, Whitehall Road, New Farnley, inform us that they are maintaining a high rate of production of spur, bevel, worm, and single helical gears. These gears can

be supplied complete, or teeth can be cut in customers' blanks. The company is experiencing a steady flow of orders for special gear units to meet individual requirements, and a large volume of contract machining work is being handled.

CAMPBELLS & HUNTER, LTD., Sayner Road, Hunslet, are experiencing a heavy demand for their services as contract machinists and gear cutting specialists from various branches of industry. Services offered include sand-blasting, case-hardening, heat treatment, and flame hardening by the Shorter process.

HAILWOOD & ACKROYD, Beacon Works, Morley, report a steady flow of orders to all departments in their works. Activities include the contract machining of small and medium size components for a variety of industries, among which may be mentioned heavy vehicle manufacture. Work undertaken includes turning up to 36 in. diameter, cylindrical and surface grinding, milling, fine boring, broaching, drilling, and tapping; the production of sand and gravity die castings both for internal requirements and on a contract basis; and the making of wood and metal patterns, again, for their own needs and for outside customers.

A considerable amount of re-equipment has been carried out in the machine shops during the past five years, and among machines installed within recent months may be mentioned four Ward 3DS capstan and two No. 7 combination turret lathes, three Herbert No. 3 capstan and two No. 9 combination turret lathes, an Omerod 14-in. stroke shaping machine, a balancing machine, and a Blohm H.F.S.6 surface grinding machine. A large works extension is now being built.

SHAFTESBURY PRECISION SERVICES, LTD., Roundhay, report a steady demand for their recently introduced Reveal-O comparator gauge. We are informed that a certain amount of development work is at present being carried out, to which we hope to make reference at a later date.

DAWSON BROTHERS, LTD., Ventnor Works, Gomersal, are extremely busy with the manufacture of their range of automatic washing, cleaning, and handling equipment, which includes bottle sterilizing and washing machines; various types of food container washing and crating machinery; and degreasing and cleaning machines for the treatment of metal parts.

The latter cover a wide range from equipment suitable for large castings weighing 50 tons or more, to the recently developed ultrasonic machine which is intended for small items such as watch movements and precision parts. We are informed that washing and sterilizing machines and equipment are exported to a number of the Continental countries, also to the U.S.S.R.

TOWLER BROTHERS (PATENTS), LTD. Electraulic Works, Rodley, are occupied with the production of their wide range of high pressure, high speed hydraulic pumps, valves and control gear. It is reported that the new design of pump which was recently introduced has been very well received in industry, and that the receipt of orders has so far been highly satisfactory.

ENGINEERING PRODUCTIONS (PUDSEY), LTD., Carlisle Road, Pudsey, report a steady demand for their services as contract machinists and makers of prototype and special machines from numerous companies engaged in a diversity of activities. To increase the works capacity a number of machines has recently been installed including a Richards horizontal borer, a Mitchell (Keighley) 10½-in. by 20-ft. centre lathe, and two Archdale vertical milling machines with tables of 49 in. by 14 in.

Other activities include fabrication of a variety of steel assemblies with unit weights ranging up to 10 tons. The equipment in the fabrication shop has recently been augmented by a Hancomatic multiple head profile cutting machine, and we are informed that the set of plate bending rolls which this company recently designed and built for their own use is working to full capacity, and that a further set is in process of construction.

A new administration block including commercial and drawing offices has recently been completed, and the erection of a works extension of some 5,400 sq. ft. will shortly begin.

R. SUTCLIFFE.

Henry Beakbane (Fortox), Ltd.

The facilities for the manufacture of flexible corrugated bellows and gaiters, machine slide covers, seals, and packings, will be greatly improved when the new works, specially built for the production of such parts by Henry Beakbane (Fortox), Ltd., on the Oldington Trading Estate, Stourport Road, Kidderminster, Worcs., go into operation. This company, which has been connected with the tanning industry for nearly 100 years in Stourport, Worcs., is transferring the head office to the new works where the manufacture of Fortox products is to be concentrated to meet the expanding market.

It may be noted that Fortox leather bellows and corrugated slide covers were introduced only seven years ago and have since been widely adopted in industry for the protection of slideways and shafts of machine tools against the damaging effects of

abrasive particles and corrosive atmospheres. Recently, the range of materials employed in the manufacture of Fortox products has been widened to include PVC, Neoprene, and coated fabrics. Fortoxil impregnated leathers are frequently employed for applications which involve extremes of temperature.

The new works, which are of single-storey construction, have been so designed as to permit extension, when necessary, without interruption to production.

Machine Tool Research

The Machine Tool Industry Research Association was incorporated on December 22, 1960. In consequence the Association is now a completely separate legal entity which, although launched by the Machine Tool Trades Association, will in future conduct its own affairs in accordance with its memorandum and articles of association, as approved by the Board of Trade.

Mr. A. E. De Barr, B.Sc., F.Inst.P., at present a head of department at the Shirley Institute, has been appointed Director of Research. His experience has covered a wide range of research and development, including control of activities involving fundamental research on basic mechanical processes, economic and management studies, automatic processing, and control systems. His publications include text books and papers in scientific and technical journals and he has a special interest in technical education. Mr. De Barr will take up his full-time duties as Director on April 1.

In the meantime, arrangements have been made for carrying out the many preliminary activities inseparable from the founding of this important Association, and the temporary address of the M.T.I.R.A. is still c/o The Machine Tool Trades Association, Brettenham House, Lancaster Place, London, W.C.2.

Steps are now being taken, however, in consultation with the appointed Director, to secure permanent headquarters, and it is probable that they will be situated near one of the heavy concentrations of the machine tool industry in the provinces.

Forms of application for membership are now being placed in the hands of those firms who gave the M.T.T.A. signed undertakings to support the research project for a minimum of five years. As a result of completion of these applications, the first roll of membership of the M.T.I.R.A. will be available for publication in the near future. This will represent about one-third of the estimated potential membership, which, it is hoped, will embrace the whole industry within reasonable time.

There is every ground for hoping that full recognition of the M.T.I.R.A. will be given by the Department of Scientific and Industrial Research, especially as regards financial support.

New Works for Stuart Davis, Ltd.

The new office premises and works of Stuart Davis, Ltd., at Stonebridge Highway, Coventry, were formally opened recently by Mr. John Honson, O.B.E., Q.C., M.P. Built at a cost of more than £35,000, these new premises occupy a 2-acre site on the Coventry By-Pass, which connects with the M.1 motorway.

Of modern design, the office building has a floor area of 4,000 sq. ft., and houses the sales, commercial, and technical departments of the company. The illustration shows a view of part of the adjacent works, which provide a floor space

View showing part of the new works of Stuart Davis, Ltd., at Stonebridge Highway, Coventry

of 10,000 sq. ft., and are devoted to the production of fine borers, Heligrind gear grinding machines, and compressed air equipment in the company's range. Of portal steel frame construction, with brick cladding, the building has 60-ft. wide roof spans, and the height to the eaves is 17 ft. 6 in. A 5-ton capacity overhead electric crane has been installed in one of the bays. Good natural lighting is afforded by glazed portions of the roof, and a high-intensity artificial lighting has been provided. It is proposed to build an extension for re-conditioning machine tools for customers, which is carried out at present in other premises.

Orders have been received from Sweden, France, and Australia, for the company's fine borers, and from Japan, U.S.A., and Sweden for the Heligrind gear grinding machines. We may also note that compressed air equipment is exported to numerous countries, including Russia. Type FB. 1A single-ended, and type FB. 2A double-ended fine borers will shortly be introduced by the company to supplement the type FB. 1 and type FB. 2 machines which they already build. These new, larger-capacity, machines will have 28-in. wide bridges at the ends of the beds, each of which will accommodate a maximum of four boring spindles. The distance between the bridges on the double-ended machine will be 34 in., and the table will have a 12- by 28-in. working surface, and a travel of 15 in. Drive for the boring spindles will be taken from a 5-h.p. motor, and there will be a 4-in. diameter hydraulic cylinder for the table traverse motions.

New Appointments

The following appointments have been announced:—

MR. RONALD G. HOOKER, J.P., as deputy managing director of K & L Steelfounders & Engineers, Ltd., Letchworth.

MR. K. R. BOYDELL, M.Sc.Tech., as chief engineer of the Engineering Division of Dowty Hydraulic Units, Ltd., Ashchurch, Glos.

MR. W. L. WATSON, as works manager at the Ferrybridge works of Pollard Bearings, Ltd. He previously held the position of works manager at the Northampton works.

MR. GLYN MITCHELL to the board of Pratt Precision Hydraulics, Ltd. He joined F. Pratt & Co., Ltd., Lister Lane, Halifax, as works director in September, 1960.

MR. CHARLES F. DICKSON, O.B.E., who has been a director of Crompton Parkinson, Ltd., Crompton House, Aldwych, London, W.C.2, since 1939, as a vice-chairman of the company.

MR. S. A. CLODD, M.I.B.M., M.I.Prod.E., to the board of E. K. Cole, Ltd. Formerly works manager and executive director, Mr. Clodd joined Ekco during the war as material controller.

MR. D. H. BING, as a sales engineer for Smart & Brown (Machine Tools), Ltd. He will operate from the sales office at 25 Manchester Square, London, W.1. Mr. Bing has been with the company for a number of years, and succeeds Mr. I. T. Jackman, who has left the organization.

MR. J. F. DOUGLAS, M.Sc.(Eng.), A.C.G.I., D.I.C., A.M.I.C.E., A.M.I.Struct.E., formerly principal lecturer in the department of mechanical engineering at the Borough Polytechnic, London, S.E.1, as head of the department, in succession to Mr. G. L. H. Bird, who has recently taken up the appointment of education officer with the Machine Tool Trades Association.

MR. S. TUDOR, as production manager of Alfred Ellison, Ltd., Black Lake Ironworks, West Bromwich. An Associate of the British Institute of Foundrymen, he has represented the company in the north of England for the past 11 years, and previously, for 14 years, was on the drawing office and design staff of the associate company, George Ellison, Ltd. Mr. Tudor has been succeeded in the north of England by Mr. J. K. Gascoigne, who is also an Associate of the British Institute of Foundrymen, and for the past 2½ years has served as a technical sales engineer with Wm. Whiteley & Sons, Ltd., Foundries Division, Huddersfield.

Standard for Roughness Specimens

A revised British Standard (B.S. 2634 : Part 1 : 1960) has been issued which covers both flat-ground and cylindrically-ground types of roughness comparison specimens, and will ensure that the specimens correspond more closely to those produced in America and Canada. The range of roughness grades has been extended to provide comparison surfaces of 1, 2, 4, 8, 16, 32, 63, and 125 CLA. Requirements are laid down for dimensions, accuracy, general design and manufacture. These specimens can be used to afford a first idea of how the feel and appearance of the common ground surfaces are related to CLA values. They are also employed in controlling the finish of parts in production on a comparative basis.

Copies of the standard may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London, W.1 (price 4s. 6d., postage extra to non-subscribers).

Capital Expenditure in 1961

Estimates based on forecasts submitted to the Board of Trade by a sample of companies towards the end of 1960 indicate that the fixed capital expenditure of private industry and business, as a whole, in 1961, will be about 20 per cent above the level for last year. For manufacturing industry, the anticipated increase is 30 per cent. It is pointed out, however, that such estimates must be accepted with caution, since they are based on plans which may be altered as the year progresses.

In manufacturing industry, there is expected to be a rise of 40 per cent in expenditure on building work, and of slightly less than 30 per cent on plant, machinery, and vehicles. The industries mainly involved, it is believed, will be those concerned with iron and steel, motor vehicles, and paper, but other industries will " also contribute to what is a widespread tendency."

New Companies Registered*

FORM AND SURFACE GRINDING, LTD., Holly House, Castellau Road, Beddau, nr. Pontypridd, Glam. Registered January 16, 1961. Nom cap.: £1,200 in £1 shares. Directors: R. J. T. Tree, R. T. Payne and P. L. Gimblett.

ROCSON TOOL CO., LTD., Bodmin Road, Wyken, Coventry. Registered January 11, 1961. Nom. cap.: £1,000 in £1 shares. Directors: J. Sharrocks and A. J. Harrison.

K. N. BEARINGS, LTD., 58 Shepherd Street, Wolverhampton. Registered January 11, 1961. To carry on the business of manufacturers of and dealers in all kinds of bearings, precision engineers, etc. Nom. cap.: £1,000 in £1 shares. Directors: J. K. Kershaw, S. Nash, M. P. Kershaw and G. Nash.

PRECISION PRESS BRAKES, LTD., Mucklow Hill, Halesowen, Worcs. Registered January 10, 1961. To carry on the business of press brake products, etc. Nom. cap.: £6,000 in £1 shares. Directors: G. D. Hopkinson, J. C. Lees, F. A. G. Clement, N. A. Tye and E. W. L. Tye.

AUSTIN S. BEECH (COMPONENTS), LTD., Precision Works, Vimy Road, Linslade, Leighton Buzzard. Registered January 16, 1961. To carry on the business of manufacturers of and dealers in machines, components of machines. etc. Nom. cap.: £5,000 in £1 shares. Directors: A. S, Beech, K. B. West, J. C. Howard, M. E. Nixon and J. A. Barrett.

*From the lists compiled by Jordan & Sons, Ltd., Company Registration Agents, 116-118 Chancery Lane, London, W.C.2.

Coming Events

THE PLASTICS INSTITUTE. *Midlands Section.* February 17, at 6.30 p.m., at the James Watt Memorial Institute, Great Charles Street, Birmingham, 3; lecture on "Toolmaking Methods and Materials," by J. P. Fox, B.Sc.

INSTITUTION OF PRODUCTION ENGINEERS. *Birmingham Section.* February 15, at 7 p.m., at the James Watt Memorial Institute, Great Charles Street, Birmingham; lecture on "The Effect of Pacing on Work Performance," by Professor N. A. Dudley, Ph.D., B.Sc. *Birmingham Graduate Section.* February 14, at 7 p.m., at the James Watt Memorial Institute, Great Charles Street, Birmingham; lecture on "Shear on Press Tools—A New Approach," by J. A. Saunt. *Wolverhampton Graduate Section.* February 15, at 7 p.m., at the G.K.N. Research Laboratory, Birmingham New Road, Lanesfield, Wolverhampton; lecture on "Spark Erosion and its Applications," by B. J. Carver, B.Sc.(Eng.). *Glasgow Section.* February 16, at 8 p.m., at The Institution of Engineers and Shipbuilders, 39 Elmbank Crescent, Glasgow, C.2; lecture on "Some Industrial Applications of Magnetic Power," by T. G. Hawker, B.Sc. *London Graduate Section.* February 15, at 7.15 p.m., at 10 Chesterfield Street, W.1; lecture on "The Function and Scope of Modern Materials Handling," by W. G. Rumble. *South Essex Section.* February 15, at 7.30 p.m., at the Hoffmann Social Centre, The Hoffmann Manufacturing Co., Ltd., Chelmsford; lecture on "New Welding Techniques," by G. Cubitt-Smith. *Reading Section.* February 16, at 7.30 p.m., in the Blue Room, Cheapside Entrance, Reading Co-operative Society, Ltd., Cheapside, Reading; lecture on "Precision Investment Casting," by P. G. Chapman. *Southampton Section.* February 16, at 7.15 p.m., at the Polygon Hotel, Southampton; lecture on "Materials Handling," by H. P. Mott.

INSTITUTION OF PLANT ENGINEERS. *Manchester Section.* February 14, at 7.15 p.m., at the Engineers' Club, Albert Square, Manchester; lecture on "The Introduction of Planned Maintenance Systems," by A. F. Stedman.

Home Agency Agreement

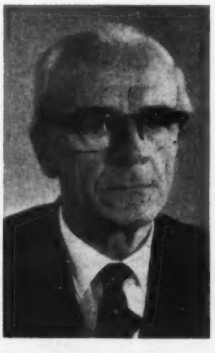
A model form of agreement for the employment of home agents represents a useful addition to the list of documents issued by the Gauge and Tool Makers' Association, Standbrook House, Old Bond Street, London, W.1. It covers terms of appointment, period of agreement, remuneration, interchange of information, acceptance of orders, trade secrets, payment for goods, termination, and arbitration. Specimen copies of this agreement can be obtained from the above address (price 2s. each).

Personal

MR. C. H. HUNT recently joined High Precision Equipment, Ltd., Bletchley, Bucks., as production manager. MR. S. J. WALLACE will continue to hold the position of works manager.

MR. J. HENDERSON, M.I.Mech.E., M.I.Prod.E., M.N.E.C.Inst., A.M.I.W., has been appointed general works manager of C. A. Parsons & Co., Ltd., Newcastle-upon-Tyne, 6, in succession to Mr. W. Winter, who retired on December 31.

PROF. W. JOHNSON, D.Sc., has succeeded PROF. H. WRIGHT BAKER as head of the Department of Mechanical Engineering at Manchester College of Science and Technology. Prof. Baker recently retired on reaching the age-limit and is now in India to advise on the establishment of a Central Mechanical Engineering Research Institute at Durgapur.



Mr. H. Richards

MR. HARRY RICHARDS, chairman of Wolf Electric Tools, Ltd., Pioneer Works, Hanger Lane, London, W.5, has retired after 53 years' service. He will, however, retain his seat on the board of Wolf Electric Tools (Holdings), Ltd., so that his knowledge and experience will continue to be available to the organization. Mr. Richards joined the company as service manager in 1907, and was appointed a director in 1926, and works director of the first Wolf factory in 1932. He became managing director in 1933, and chairman in 1951.

Industrial Notes

ADAM MACHINE EQUIPMENT, LTD., are now occupying larger premises at Forrester House, St. Peters Street, St. Albans, Herts. The telephone number and telegraphic address have not been changed.

FIRTH CLEVELAND TOOLS, LTD., 7 Cleveland Row, St. James's, London, S.W.1, have formed an Industrial Division following the introduction of the new industrial type Surform tool.

ENGINEERING INDUSTRIES ASSOCIATION DISPLAY.—The North-East London Group of the E.I.A. will hold a one-day display of products and services offered by local member firms, at Ilford Town Hall on February 16, from 2.30 to 9.30 p.m.

THE UNITED STEEL COMPANIES, LTD., have acquired G. R. Turner, Ltd., Langley Mill, Nottingham, which will in future be controlled by United Steel Structural Co., Ltd., of Scunthorpe. Additional capacity for the fabrication of structural steelwork, will thus be provided.

MATBRO MACHINE TOOLS, LTD., is the title of a new subsidiary of the Matbro Group of companies, with offices and showrooms at Matbro House, Beddington Lane, Croydon, Surrey. Mr. F. K. Derrick has been appointed managing director of this new company.

PEARSON PANKE, LTD., 1-3 Hale Grove Gardens, Mill Hill, London, N.W.7, inform us that the following are now included in the range of sheet metal working machinery for which they are agents:

Weingarten single- and double-acting, C-frame and double-sided presses, and transfer presses.

Lodge & Shipley guillotines and press brakes.

A COURSE IN ELEMENTARY PLASTICITY will be held at the Imperial College of Science and Technology, Department of Mechanical Engineering, City and Guilds College, Exhibition Road, London, S.W.7, from April 10 to 14. The fee is £10 10s. Copies of the syllabus are obtainable from the Registrar at the above address, to whom application for admission should be made.

FIXED CAPITAL EXPENDITURE BY MANUFACTURING INDUSTRY, at current prices, is estimated to have totalled £264·6 million in the third quarter of 1960, of which plant and machinery accounted for £176·3 million. For the first nine months of the year the corresponding figures were £708·3 million and £469·2. In the full year 1959 the total was £819·7 million (including £565·7 million for plant and machinery), in 1958, £892·8 million (£619·4 million) and in 1957, £902·5 million (£619·8 million).

RANSOMES & RAPIER, LTD., Ipswich, are now completing the erection, at their works, of the Rapier W.1350 walking dragline which has been built for Calgary Power, Ltd., Canada. This dragline weighs 1,400 tons and operates a 33-cu. yard bucket, capable of excavating and carrying 50 tons of material at a radius of 215 ft. When the dragline has been dismantled, the parts will be shipped to Vancouver via the Panama Canal, and will thence be transported through the Rocky Mountains by rail for assembly at Wabamun, near Edmonton.

THE SEVENTH INTERNATIONAL PACKAGING EXHIBITION will be held at Olympia, London, from September 5 to 15. It is stated that the number of exhibitors of packaging materials, containers, machinery, and equipment will exceed 300, and that the space occupied—the Grand and National Halls—will amount to approximately 300,000 sq. ft., or more than twice the area of the exhibition which was held in 1955.

The exhibition is being staged by Provincial Exhibitions, Ltd., City Hall, Deangsate, Manchester, 3, in association with F. W. Bridges & Sons, Ltd., in collaboration with the Institute of Packaging.

A NATIONAL MAINTENANCE CONFERENCE AND EXHIBITION is to be held at the Central Hall, Westminster, London, S.W.1, from November 13 to 16. In this connection attention is drawn to the growing importance of maintenance as industrial processes become more highly automated. The conference will cover many aspects of the maintenance manager's work, and at the exhibition many firms will be showing products and processes relating to maintenance work. Full particulars may be obtained from The Conference Organizer, National Maintenance Conference and Exhibition, 109-119 Waterloo Road, London, S.E.1.

STEIN ATKINSON VICKERS HYDRAULICS, LTD., 197 Knightsbridge, London, S.W.7, are to hold, for the benefit of service engineers and designers, a 3-day course in Belfast, from March 1 to 3, on hydraulic installation and maintenance. The syllabus will also cover descriptions of the range and operation of equipment marketed by the company, general hydraulic principles and auxiliary components. A prospectus and application form can be obtained from the school secretary at the above address, as can details of the two-day courses which are held regularly at the company's new Birmingham premises.

J. BROCKHOUSE & CO., LTD., have acquired the Denton, Lancashire, machine tool works of Craven Bros. (Manchester), Ltd., together with all machinery and equipment, to enable their Machine Tool Division to expand, and to provide for a larger output of Lester injection moulding machines which they build under licence in this country. Sufficient capacity is also available at this 70,000 sq. ft. factory to permit extension of the Lester programme, to cover the production of die casting machines. The division, it may be noted, has already started to build the 6/9-oz. injection moulding machine, at Elms Works, Wolverhampton.

ENGINEERING AND ELECTRICAL GOODS.—It is reported that there was some quickening in November in the flow of new orders to the industries producing engineering and electrical goods (Order VI of the Standard Industrial Classification), locomotives and railway track equipment, railway carriages and wagons, heavy commercial vehicles, and wheeled tractors, and the volume of orders on hand rose. This increase applied to orders from overseas as well as to orders from the home market.

It is estimated that in the engineering and electrical goods industries the volume of production in November was

about the same as in November, 1959, whereas in October production was 4 per cent more than a year earlier.

THE 13TH LIEGE INTERNATIONAL FAIR will be held from May 27 to June 11. There will be 22 industrial groups, among which may be mentioned: cast iron and steel; non-ferrous metals; wire drawing and rolling; forging and stamping; tooling and machine tools; light engineering accessories; mechanical handling and welding; machinery and heavy engineering; industrial electricity and electronics; precision engineering; and industrial safety devices. During the period of the Fair, seven national and internation conferences will be staged, which will be concerned, for example, with non-destructive methods of testing materials; the fight against industrial vibration; and the "stiction" of moving parts in machine tools. Full particulars concerning the Fair and conferences can be obtained from the United Kingdom representative, R. C. Liebman, 178 Fleet Street, London, E.C.4.

Scrap Metals

*LONDON.—†Prices per ton for non-ferrous scrap metals free from iron are as follows:—Clean copper wire, untinned and free from lead and solder, £187; clean heavy copper, untinned and free from lead and solder, £181; copper wire No. 2, £175; clean light copper, £171; braziery copper, £163; gunmetal, £167; brass, mixed, £118; lead, net, £50; zinc, £41; cast aluminium, £97; old rolled aluminium, £100; battery lead, £24; unsweated brass radiators, £95; hollow pewter, £535; black pewter, £410.

MIDLANDS.—The reduction in tonnages of scrap from many Midland factories has resulted in local merchants curtailing overtime working by their transport and yard staffs. Yard stocks are very much reduced as merchants have been processing more material from their yards to maintain deliveries to meet consumers' requirements. Many foundries are in urgent need of cast iron scrap and prices have improved for all grades. This shortage is difficult to combat because few parcels are on offer at present, but merchants are sharing all supplies that are forthcoming between their regular customers.

Heavy steel of grades 1 and 2 is wanted, also limited deliveries of 0·04 S. and P. scrap in steelworks sizes. Hydraulically compressed bales of grades 4 and 5 are moving steadily, but shortage of new light steel cuttings is limiting production of No. 4 bales.

Local markets are not taking such large quantities of chipped turnings, but no difficulty is experienced in placing this material in other areas. The call for bushy turnings is steady.

Light iron for direct delivery to works or for delivery to local yards is more difficult to find. Destructor scrap for pressing is wanted as prices for compressed bales have improved by about 10s. per ton. Prices for short steel are firm, and demand for deliveries has improved over the past two weeks.

In general scrap is harder to obtain, although merchants have so far maintained supplies to steelworks and blast furnaces.

* George Cohen, Sons & Co., Ltd., 600 Wood Lane, London, W.12.
† Subject to market fluctuations.

BRITISH MACHINE TOOL

Exports of New Machine Tools

Countries	Bar and Chucking Automatics		Vertical Boring Machines		Other Boring Machines		Drilling Machines		Gear-cutting Machines		Grinding, Lapping and Honing Machines		Capstan and Turret Lathes		Other Lathes	
	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £
Commonwealth																
South Africa	—	—	—	—	—	—	103 (11)	3,098	136 (2)	7,226	377 (14)	13,003	293 (5)	10,733	860 (53)	34,073
India	17 (2)	1,930	534 (1)	29,303	491 (4)	21,512	295 (23)	14,419	45 (1)	3,696	576 (35)	35,557	963 (17)	39,086	53 (4)	3,738
Pakistan	—	—	—	—	—	—	—	—	—	—	114 (12)	3,938	—	—	—	—
Australia	330 (5)	17,940	226 (2)	9,818	1,177 (4)	39,112	993 (28)	23,402	—	—	670 (13)	20,403	1,258 (29)	52,686	1,206 (39)	43,382
New Zealand	—	—	—	—	—	—	65 (13)	1,254	—	—	25 (5)	953	95 (3)	4,745	656 (27)	21,464
Canada	—	—	42 (1)	3,135	— (1)	70	474 (9)	10,005	—	—	135 (8)	7,039	180 (4)	6,559	376 (7)	11,136
Miscellaneous	—	—	—	—	—	—	217 (53)	5,839	—	—	42 (8)	1,133	17 (4)	702	744 (28)	24,502
Foreign																
Soviet Union	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sweden	—	—	—	—	—	—	62 (3)	2,116	—	—	280 (5)	13,199	411 (10)	20,370	8 (5)	311
Norway	—	—	—	—	—	—	—	—	—	—	34 (2)	1,969	51 (1)	1,900	35 (2)	1,237
Denmark	—	—	—	—	—	—	81 (3)	2,364	53 (1)	3,778	1 (1)	57	250 (3)	11,291	212 (31)	9,017
Western Germany	—	—	—	—	—	—	131 (14)	3,424	—	—	149 (6)	13,114	198 (5)	9,218	574 (28)	25,486
Netherlands	27 (1)	1,851	—	—	—	—	133 (15)	5,257	9 (3)	372	700 (8)	28,157	821 (33)	34,889	20 (12)	671
Belgium	—	—	—	—	—	—	105 (3)	3,446	4 (1)	124	191 (10)	8,669	123 (2)	2,409	135 (4)	6,190
France	230 (3)	11,290	—	—	150 (2)	10,022	51 (3)	4,237	—	—	297 (9)	13,743	585 (9)	27,509	172 (1)	7,787
Switzerland	—	—	—	—	29 (1)	2,115	58 (2)	1,719	—	—	18 (2)	1,305	113 (5)	6,284	141 (24)	9,471
Spain	—	—	—	—	—	—	—	—	—	—	18 (1)	3,212	—	—	—	—
Italy	40 (1)	5,488	—	—	—	—	—	—	—	—	447 (10)	21,533	35 (1)	1,512	—	—
U.S. America	—	—	360 (1)	6,546	50 (1)	2,397	70 (8)	2,545	45 (1)	4,381	543 (27)	43,434	179 (3)	7,195	1,104 (60)	40,857
Miscellaneous	—	—	—	—	7,020 (3)	128,784	591 (32)	17,054	15 (1)	1,205	954 (65)	49,130	386 (19)	17,522	949 (58)	48,286
Total	644 (12)	38,499	1,162 (5)	48,802	8,917 (16)	204,012	3,429 (220)	100,179	307 (10)	20,782	5,571 (241)	279,548	5,958 (153)	254,610	7,245 (383)	287,608

Total exports of reconditioned machine tools: Quantity, No. 141; Weight, 6,031 cwt.; Value, £60 021.
Total exports of imported machine tools: Quantity, Weight, 1,026 cwt.; Value, £48,053.

Imports of New Machine Tools

Country of of Origin	Bar and Chucking Automatics		Vertical Boring Machines		Other Boring Machines		Drilling Machines		Gear-cutting Machines		Grinding, Lapping and Honing Machines		Capstan and Turret Lathes		Other Lathes	
	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £
Sweden	—	—	—	—	—	—	6 (3)	146	93 (1)	3,740	308 (12)	15,553	—	—	51 (4)	2,091
Western Germany	242 (3)	13,195	576 (6)	31,804	1,552 (10)	56,884	202 (26)	11,039	166 (2)	8,792	1,660 (109)	89,413	653 (14)	37,019	651 (58)	30,159
France	—	—	—	—	—	—	58 (4)	2,923	—	—	3 (1)	237	—	—	162 (4)	7,397
Switzerland	528 (31)	44,862	695 (10)	61,241	49 (3)	5,941	42 (11)	4,516	164 (6)	12,714	180 (23)	17,396	89 (2)	8,484	370 (11)	33,030
U.S. America	—	—	—	—	50 (1)	791	— (1)	181	1,136 (11)	51,064	1,438 (20)	164,882	87 (1)	7,023	1,521 (6)	93,269
Miscellaneous	—	—	41 (2)	1,978	264 (3)	5,093	171 (9)	3,161	36 (2)	1,074	512 (24)	21,112	24 (1)	477	569 (23)	16,936
Total	770 (34)	58,057	1,312 (18)	95,023	1,915 (17)	68,709	479 (54)	21,966	1,595 (22)	77,384	4,101 (189)	308,593	853 (18)	53,003	3,324 (106)	182,882

Total imports of reconditioned machine tools: Quantity, No. 82; Weight, 13,260 cwt.; Value, £166,267.

IMPORTS AND EXPORTS (Classified)

and Parts during October, 1960

Milling Machines		Presses		Sheet-metal Working Machines		Sawing Machines		Screwing and Threading Machines		Planing, Shaping and Slotting Machines		Unit Transfer Machines and Heads		Other Machines		Machine Tool Parts*		Total	
Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No	£	Quantity. Cwt. and No.	£	Quantity. Cwt. and No.	£	Quantity. Cwt. and No.	£	Quantity. Cwt.	£	Quantity. Cwt. and No.	Value £
189 (2)	9,835	425 (14)	6,726	386 (6)	7,770	32 (6)	740	44 (2)	1,130	137 (3)	2,722	—	—	415 (19)	15,190	240	12,920	3,637 (137)	125,166
634 (7)	36,983	10,836 (13)	282,531	18 (1)	861	118 (3)	2,810	127 (4)	7,821	145 (2)	9,070	—	—	55 (9)	6,907	1,182	49,670	16,089 (126)	545,794
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	80	4,048	194 (12)	7,986
272 (11)	13,092	2,986 (6)	65,563	88 (2)	1,823	138 (1)	3,176	43 (2)	606	— (1)	36	—	—	37 (6)	2,200	1,051	49,167	10 475 (149)	342,406
—	—	1 (9)	105	4 (12)	36	230 (8)	5,208	37 (1)	919	35 (2)	816	—	—	18 (4)	746	264	19,197	1,430 (84)	55,443
85 (2)	5,653	—	—	347 (9)	7,703	130 (1)	2,410	—	—	100 (2)	1,895	—	—	—	—	112	12,008	1,981 (44)	67,613
1 (1)	62	38 (13)	1,176	476 (6)	11,379	78 (4)	1,753	54 (5)	2,147	72 (9)	1,047	— (1)	17	65 (12)	2,172	164	7,709	1,968 (144)	59,638
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
111 (3)	5,861	34 (1)	602	—	—	—	—	41 (2)	3,200	—	—	—	—	72 (4)	1,803	34	4,530	1,053 (33)	51,992
—	—	499 (1)	10,955	—	—	—	—	—	—	—	—	—	—	31 (3)	1,002	15	1,154	665 (9)	18,217
—	—	6 (3)	146	—	—	15 (1)	394	23 (2)	830	—	—	—	—	151 (4)	8,948	30	1,634	822 (49)	38,509
212 (3)	7,488	411 (5)	20,921	—	—	15 (2)	1,350	71 (1)	3,197	467 (2)	15,277	—	—	298 (8)	14,036	187	9,386	2,713 (74)	122,897
107 (11)	7,103	5 (3)	1,388	473 (4)	17,880	—	—	13 (1)	656	—	—	—	—	97 (2)	6,081	60	7,129	2,465 (93)	111,434
70 (1)	6,058	—	—	—	—	—	—	—	—	—	—	—	—	219 (2)	10,323	95	5,207	942 (23)	42,426
319 (4)	18,700	23 (1)	1,525	2 (1)	229	—	—	—	—	109 (4)	6,498	—	—	241 (8)	9,026	122	12,671	2,301 (45)	123,237
10 (3)	482	—	—	4 (1)	419	—	—	6 (1)	1,520	—	—	—	—	—	—	17	1,800	396 (39)	25,115
—	—	—	—	35 (1)	2,462	—	—	14 (1)	479	—	—	—	—	67 (1)	2,517	2	586	136 (4)	9,256
—	—	—	—	—	—	13 (2)	251	20 (1)	1,854	—	—	—	—	—	—	73	8,563	628 (15)	39,201
267 (4)	10,422	47 (2)	5,394	35 (6)	2,217	—	—	171 (6)	12,848	29 (1)	663	— (3)	129	48 (7)	2,730	308	22,951	3,256 (130)	164,709
112 (5)	6,110	499 (6)	10,326	255 (39)	4,947	32 (4)	1,033	165 (15)	11,985	422 (12)	13,234	—	—	2,946 (37)	86,592	257	21,012	14,603 (296)	417,220
2,389 (57)	127,849	15,810 (77)	407,358	2,123 (88)	57,726	801 (32)	19,125	829 (44)	49,192	1,516 (38)	51,258	— (4)	146	4,760 (126)	170,173	4,293	251,392	65,754 (1,506)	2,368,259

Figures in parentheses denote number of machines. * Not including machine tool cutting parts.

and Parts during October, 1960

Milling Machines		Presses		Sheet-metal Working Machines		Sawing Machines		Screwing and Threading Machines		Planing, Shaping and Slotting Machines		Unit Transfer Machines and Heads		Other Machines		Machine Tool Parts*		Total	
Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	£	Quantity. Cwt. and No.	£	Quantity. Cwt. and No.	£	Quantity. Cwt. and No.	£	Quantity. Cwt.	£	Quantity. Cwt. and No.	Value £
154 (5)	6,967	2 (1)	55	233 (7)	4,335	—	—	—	—	3 (2)	216	—	—	—	—	81	3,760	931 (35)	36,863
3,513 (32)	147,273	1,419 (16)	42,128	414 (31)	15,109	281 (32)	11,219	499 (20)	32,244	118 (3)	3,499	—	—	1,914 (55)	113,937	394	42,378	14,254 (417)	686,092
660 (10)	31,380	195 (4)	5,028	82 (1)	6,400	21 (5)	891	—	—	—	—	—	—	36 (9)	1,953	65	7,034	1,282 (38)	63,243
914 (11)	52,813	22 (3)	2,205	355 (3)	9,731	22 (9)	1,482	—	—	—	—	—	—	83 (27)	10,999	105	23,686	3,618 (150)	289,100
2,619 (13)	125,484	488 (12)	22,562	56 (13)	5,369	20 (1)	982	826 (87)	60,788	684 (3)	47,630	—	—	510 (16)	17,766	2,013	205,420	11,448 (185)	803,211
659 (20)	22,447	881 (24)	13,750	245 (17)	16,035	155 (18)	3,566	—	—	90 (5)	12,315	—	—	136 (14)	9,698	589	19,515	4,372 (162)	147,157
8,519 (91)	386,364	3,007 (60)	85,728	1,385 (72)	56,979	499 (65)	18,140	1,325 (107)	93,032	895 (13)	63,660	—	—	2,679 (121)	154,353	3,247	301,793	35905 (987)	2,025,666

Figures in parentheses denote number of machines. * Not including machine tool cutting parts.

Trade Publications

PRECISION GEAR MACHINES & TOOLS, LTD., Red Ring Works, Bodmin Road, Wyken, Coventry. Brochure describing the Red Ring recirculating ball nut and screw which is now available in an improved form. Some typical applications are illustrated.

EXPANDED PLASTICS, LTD., Mitcham Road, Croydon, Surrey.—Informative booklet entitled "Making Polyzote Mouldings." Sections are devoted to raw material, density, pre-expansion, storage, moulding, cooling, faulty processing, and finishing.

GRIFFIN & GEORGE, LTD., Ealing Road, Alperton, Wembley, Middlesex. Price list covering the company's very wide range of volumetric and lampblown glassware for use in educational, industrial, and research laboratories.

ELCONTROL, LTD., Wilbury Way, Hitchin, Herts. Data sheets have been issued by this company, as follows: AW—issue 4, automatic weight control; OR/UR—issue 2, high accuracy current overload and underload relays; BC—issue 1, electronic counting and batching equipment; PR—issue 3, photoelectric control equipment; PRC—issue 5, photoelectric registration control and reflex scanner.

Machine Tool Share Market

A good level of business was maintained in stock markets during the period under review, and although the general tendency was irregular, the underlying tone remained firm.

After some setbacks, the gilt-edged section became steady, and on balance small gains predominated among British Funds and other high grade investment stocks.

In commercial and industrial share markets the position was generally satisfactory despite some irregularity in price movements. The trend for the most part was slightly upwards, and there were a few good features.

Among machine tool issues Chas. Churchill advanced 1½d. to 8s. 1½d.; Craven Bros. (Manchester), 7½d. to 10s. 9d.; H. W. Kearns, 1s. 3d. to 18s. 9d.; Newall Engineering, 6d. to 7s.; Noble & Lund, 1s. to 5s.; Samuel Osborn, 3d. to 43s. 6d.; Sheffield Twist Drill, 6d. to 16s.; and Wadkin, Ltd., 1s. 3d. to 20s. On the other hand, Edgar Allen lost 3d. at 38s. 3d.; British Oxygen, 6d. at 27s. 6d.; and Thos. W. Ward, 1s. at 64s. 6d.

B. ELLIOTT & CO., LTD. Interim dividend 7½ per cent (same).

COMPANY		Denom.	Middle Price
Abwood Machine Tools, Ltd.	Ord.	1/-	1/3xd
Allen (Edgar) & Co., Ltd.	Ord.	£1	38/3
" " "	5% Prf.	£1	14/-
Arnott & Harrison, Ltd.	Ord.	4/-	13/3
Asquith Machine Tool Corp., Ltd.	Ord.	5/-	10/-xd
" " "	6% Cum. Prf.	£1	18/9
Birmingham Small Arms Co., Ltd.	Ord.	10/-†	29/-
" " "	5% Cum. "A" Prf.	£1	ex capt. 14/6
" " "	6% Cum. "B" Prf.	£1	17/-
" " "	4% 1st Mort. Deb.	Stk.	90½
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Broom & Wade, Ltd.	Ord.	5/-	22/3
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" " "	6% Cum. Prf.	£1	25/9‡
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Shaw (John) & Sons, Wolverhampton, Ltd.	Ord.	5/-	16/3
Sheffield Twist Drill & Steel Co., Ltd.	Ord.	4/-	16/-
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Cross Feeds (12)	⅜in.-45in./min.
Vertical Feeds (12)	¼in.-18½in./min.
Rapid Return	.38in./94in./min.
Spindle Taper	50 I.S.T.
Spindle Speeds (12)	30-1100
Main Motor	6½ HP.
Traverse Motor	3½ HP.
Approx. weight	6600lbs.

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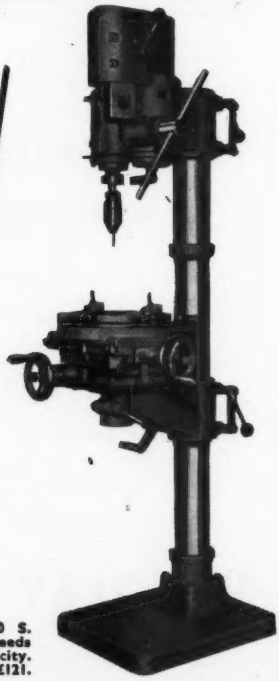

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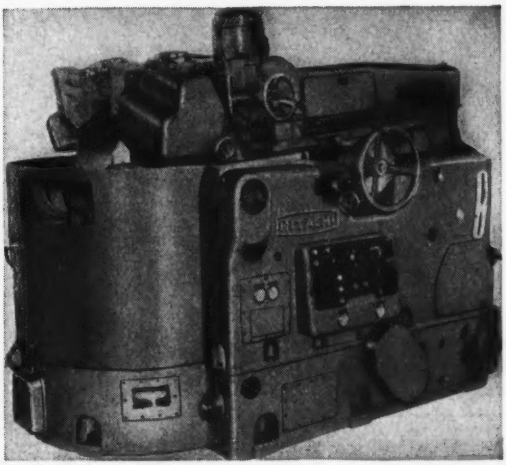
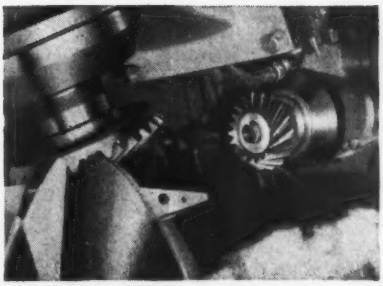
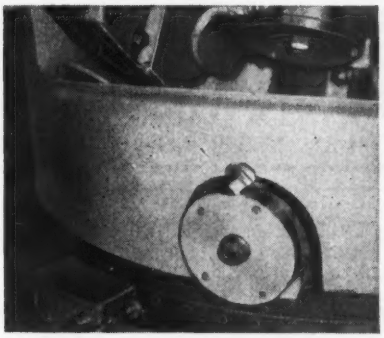


HITACHI Bevel Gear Grinder Type 600 BG-1



WORK HEAD

The photo shows that a set of gear and pinion is fitted on each work head.



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3. The same grinding wheel can be used irrespective of dimensions, helix angles, pressure angles of the bevel gears to be processed.

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Specifications:

Max. pitch dia.	610 mm.
Min. pitch dia.	50 mm.
Largest cone distance	305 mm.
Pressure angle	14½°—20°
Max. helix angle	35°
Module	2·5M—8M
Dia. of grinding wheel	400 mm.
Main Motor	5 h.p.
Size of Machine	2,765 mm. x 2,000 mm. x 1,850 mm.
Net Weight	approx. 11,00 kg.

Patents on this grinder:—

Patents have been applied for in the United States, Britain, Germany Switzerland and Italy, in addition to those already taken out in Japan.

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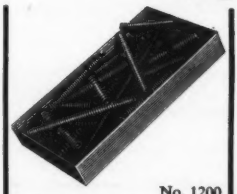

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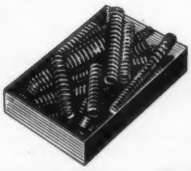

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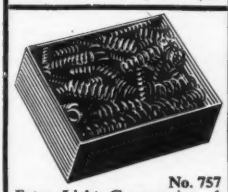

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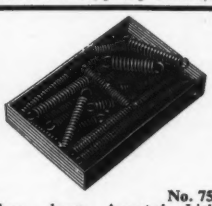

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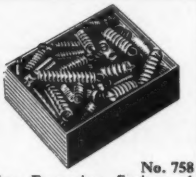

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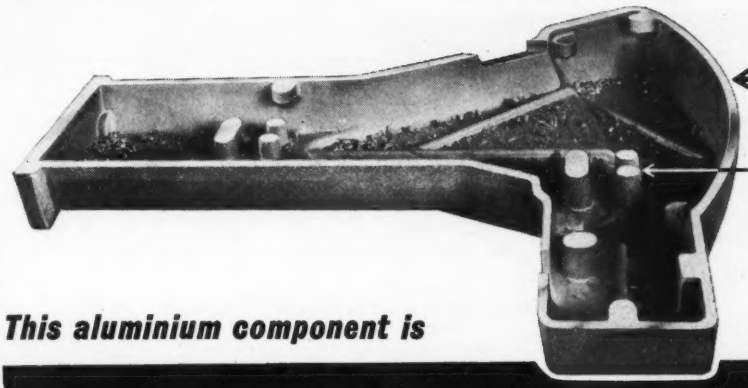

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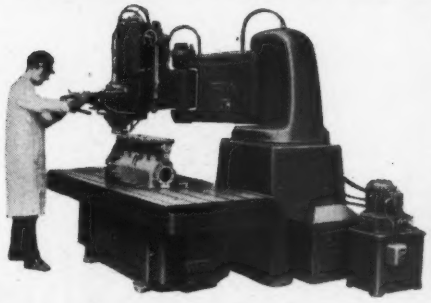

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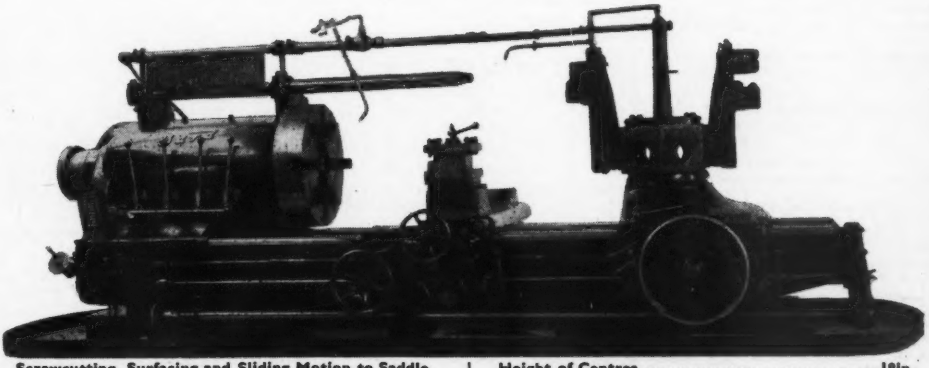

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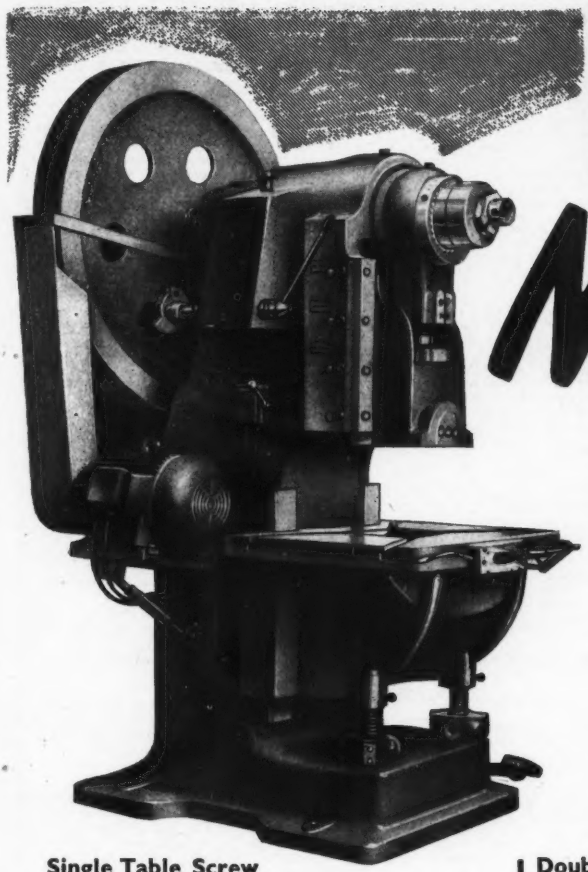

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Table area	20½" × 13¾"	21½" × 16½"	21½" × 16½"
Vertical adjustment to table ...	6⅜"	4¼"	4¼"
Adjustment of stroke	⅜"—3½"	⅜"—3½"	⅜"—3½"
Ram adjustment	2"	2"	2"
Max. distance table to ram ...	11¾"	12½"	12½"
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Stroke per minute	120	110	110
Net weight	23 cwts.	26 cwts.	27 cwts.

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35-tons	45-tons	60-tons	80 tons	100-tons
3 h.p.	3½ h.p.	4 h.p.	5½ h.p.	7·5 h.p.
21½" × 16½"	25⅜" × 18⅞"	29½" × 20½"	32¾" × 21"	35½" × 23⅜"
4¾"	5½"	8¼"	9"	9"
⅜"—3½"	⅜"—3½"	⅜"—5½"	⅜"—5½"	⅜"—5½"
2"	2½"	2½"	2½"	2½"
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ROBERTSON 7-STAGE SECTION FORMING MACHINE, with additional curving unit. Specially suitable for profiling and beading stainless steel sections. Drive is by 20 h.p. motor through 3-speed gearbox. Diameter of roller shafts, 2in. Length of shafts available for forming rollers, 8½in. Rolling speeds with 6in. diameter rollers, 40, 80 and 120ft. per minute. Weight about 11¼ tons. Full details and illustrations from—

F. J. EDWARDS LTD.,
359-361, EUSTON ROAD, LONDON, N.W.1.
EUSton 5000, or
41, Water St., Birmingham 3. Central 7606.

Classified Advertisements (*PLANT FOR SALE, contd.*)

Cincinnati O-8 Vertical Milling Machines. Table working surface 20in. × 6in. Automatic cycle. Good condition. £250 each.—BOX C554, MACHINERY, Clifton House, Euston Road, N.W.1.

Kendall & Gent Profile Milling Machine, with twin spindle. S/No. 10953A. Asquith Twin spindle Profile Milling Machine, spindle speeds 250 to 3,000 r.p.m.—BOX C555, MACHINERY, Clifton House, Euston Road, N.W.1.

WARNER & SWASEY No, 2A Pre-Selected Combination Turret Lathe, 10 h.p. motor wound for 400-440/3/50 volts, 15in. three jaw chuck, knee toolholder, suds pump.

Swing over covers	20in.
Chuck to turret face	5¼in.
Hollow spindle	3¼in.
Speeds	17 to 460 r.p.m.

LOEWE FU4 Universal Milling Machine, independent self contained motor drive, all geared, mono lever operated, Universal dividing heads, tailstock, braces, arbor and supports, electric suds pump, etc.

Table overall	50in. × 18in.
Table working surface	23¾in.
9 spindle speeds	47.5 to 750 r.p.m.
12 feeds	¼in. to 22in.
Year of manufacture	1952

CHURCHILL Model A.C. Universal Internal Grinding Machine, independent motor drive suitable for parallel or taper bores in the ends of shafts or spindles. Swivelling workhead type C.

Swing over the table	22in.
Length admitted on table.. ..	84in.
Length of hole ground	29in.
Maximum tapers	6¼in./ft.

LOUIS DEMERY & SONS, LTD., 32, Hereford Street, Sheffield, 1. Ph.: 24936

Le Blond Rapid Production Lathe, 20in. swing × 32in., all geared, power trav. heavy duty, chucks, equip. perfect cond.—C. L. THOMAS, LTD., Stirling Road, Solihull. Tel.: 3065-6.

Wadkin, Radial Drill For Sheet metal, etc.—A. McNAMARA & CO., Ltd., New Line, Bacup, Lancs. 'Phone: Bacup 946.

American Toolworks Centre Lathe, 19in. Swing, 30in. between Centres. Spindle speeds 17-600 r.p.m. Excellent condition.

Further details from:—
C. & G. OLDFIELD, LTD.,
15, Abercorn Street
PAISLEY.

Barber Colman No. 3 Gear Hobber—motorised 400/3/50. C. DUGARD LTD., Denmark Villas, Hove 32471.

HARVEY (S.M.T.C.) Heavy Duty Lathe, S.S. & S.C. 18in. centres by 9ft. 6in. b.c. 29in. swing over saddle. Ball and Roller bearing spindle, 12 speeds 8-6/225 r.p.m. Rapid traverse to saddle. 32in. chuck. 15 H.P. motor 400/3/50. £2,250.
BOX C.599, MACHINERY, Clifton House, Euston Road, N.W.1.

No. 3 Drummond-Maxicut Auto- matic Gear Shaper. Capacity 18in. dia. × 5in. feed. 4/5 D.P.—LEE & HUNT, LTD., Crocus Street, Nottingham. 'Phone: 84246.

Hazelwood & Dent 12½in. Motor- ised Spinning Lathe for sale. Between centres 30in. With compound handwheel operated rest and trimming head. 3-speed drive. Motor drive for 400-440/3/50.—F. J. EDWARDS LIMITED, 359, Euston Road, London, N.W.1, or 41, Water Street, Birmingham, 3.

Kearns Horizontal Boring Ma- chine. Model "O." Table dimensions 36in. × 36in., longitudinal traverse 40in., transverse motion 15in. Spindle bore No. 5 morse taper. Speeds 72 to 620 r.p.m. Three speed motor. Cheap to clear.—BOX C557, MACHINERY, Clifton House, Euston Road N.W.1.

Classified Advertisements (*PLANT FOR SALE, contd.*)

EDWIN MILLEN & SONS LTD.

70, CLERKENWELL ROAD,
LONDON, E.C.1.

Tel.: CLE. 6064 & 3602.

DRILLING AND TAPPING

HERBERT 1-sp. Drill on three-spindle base. £165.
HAGO H.G.25 High Efficiency, ¾in. cap. £250.
THIEL ¼in. Radial Arm Tapper. £150.

GRINDERS

NORTON Uni. Hyd. Cyl. 48in. × 13in.
ABWOOD Vert. Sp. Surface, 18in. × 6in. £225.
NORTON 18in. × 7in. Hyd. Cyl. Grinder. £395.

LATHES

COLCHESTER STUDENT 6in. × 24in. Full equip.
WILLSON 7¼in. × 36in. G.B. Full equip.
SMART & BROWN Model M. Full equip.
HARRISON 4½in. × 42in. G.B. Full equip.
LITTLEJOHN 5in. × 24in. on Cab. Full equip.
MYFORD SUPER 7. As new.
MORINI & BOSSI 1¼in. bar feed and tooling.
MURAD 2C 1¾in. cap. As new.
EMPIRE 7in. × 42in. T/T. Full equip.
LANG 42in. Swing FB Lathe.
HOGARTH 6in. × 32in. S. & S. Lathe. £125.
PITTLER Turret Lathe, 2¼in. cap. £95.
RIVET Instrument Lathe, 4½in. × 24in.
SPRINGFIELD 34in. Swing F. & B. Lathe. £450.
SPRINGFIELD 14in. Swing F. & B. Lathe. £225.

MILLERS (Vert. and Horiz.)

CINCINNATI No. 2 Vert. Dial type. £850.
ARCHDALE 52in. × 14in. Vert. £475.
CENTEC No. 2 on Cab. As new. £125.
HENRY MILNES Vert. 30in. × 8in. As new.
ADCOCK & SHIPLEY 1VM Vert. 25in. × 7in. As new.
CINCINNATI No. 0-8 Vert., 24 × 9. £275.
HARDINGE 24in. × 6in. Prec. Auto feed. £165.

POWER PRESSES AND SHEET METAL MACHINES

COHEN 10 ton Friction Screw Press.
E.M.G. 9-ton Airdraulic. £200.
KENNEDY 2in. Tube Bender. £85.
FLY and Kick Presses.

MISCELLANEOUS

ORMEROD 12in. Shaper with Cam Cutting Attach.
TMA Engraver with type.
AEROGRAPH Twin Cylinder comp. 100 p.s.i.
MATHEY Jig Borer with clocks. As new.
RAPIDOR 15in. × 15in. Filing and Sawing. £165.
BUTLER 12in. Precision Slotter. £675.
PFAUTER 000 Gear Hobber, with gears. £150.
PHILLIPS 40 kVA Spot Welder. £165.
CHARLES TAYLOR 6½in. Spinning Lathe. £85.

Other machines in stock.

WE BUY | **WE SELL**
EXCHANGES WELCOME | **HIRE PURCHASE ARRANGED**

Greenwood & Batley No. 0 Solid die, single blow, Cold Heading Machine. Capacity ¾in. × 1in. long.—HICKS MACHINERY, LTD., 26, Addison Place, London, W.11. Tel.: PARk 2333.

HERBERT No. 4B Capstan Lathe, with bar feed, 415/3/50.
DRUMMOND Model K Capstan Lathe, arranged for chucking, 415/3/50.
GISHOLT No. 4 Capstan Lathe, arranged for chucking, 415/3/50.

R. O. Gray

4/6, Minerva Road, Park Royal,
London, N.W.10
Telephone: ELGar 4841/4842

Bryant No. 24-36 Hydraulic Internal Grinder complete with Hydraulic Wheel Dressing Device, Spindle, etc.

Further details from —
C. & G. OLDFIELD, LTD.,
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PAISLEY.

K·E·N·T

MILLING AND HOBBING

Maximiller Vert. Mill, 76in. × 18in., 888 T/S. Power to spindle and rapid all ways. REBUILT.
Somua F.V.2C, 60in. × 14½in. Vert. As new.
Herbert 18V Vert., 57in. × 14in. With rotary table. £525
Becker Vertical, 54in. × 14in. £150
Sant Andrea U.F.O.3, 57in. × 14in. As new.
Archdale 24in. Manufacturing. £185
Adams No. 5 Spline and Thread Hobber. £425

PRESSES AND SHEET METAL MACHINERY

Edwards 6ft. × ¼in. Rolls. New. £295
S. Platt 3in. × 14g. Tube Roller. £395
C.V.A. 10 Ton Dieing Press. Roll feed and scrap cutter fitted.
Kendall & Gent Duplex Screwing M/c. Tangential heads, 2½in. cap. £400

CAPSTAN LATHES

Ward 2A. Feed to saddle.
Gisholt No. 3 Capstan. £275
Brown & Sharpe No. 2. 1in. cap. £145
Herbert No. 9 Turret.
Smart & Brown ¼in. cap. Capstan.

LATHES

Willson 8½in. × 4ft. 6in. S.S. & S.C. £495
Niles 40in. swing × 5ft. Heavy Duty. £995
Dean, Smith & Grace S.S. & S.C., 36in. swing, 12ft. 6in. between centres.
Ditto. Non-screwcutting.
Churchill-Redman 6½in. × 3ft. 6in. £325
Lang 6½in. × 3ft. £225
Dean, Smith & Grace 8½in. Surfacing and Boring.

MISCELLANEOUS

Acme Gridley 6-sp. Auto, ¾in. cap.
Maiden Bar-ending Machine.
Granor 26in. Heavy Duty Shaper. £575
Coventry Climax 1,500lb. Fork Lift Truck.
Cincinnati 12in. × 48in. Univ. Grinder. £750

Many other machines in stock.
All motorised 440/3/50.

K·E·N·T MACHINERY & ENGINEERING CO.
Datchelor Place Mews, London, S.E.5
Telephone: ROD. 4149

Rockford 28in. Hydraulic Shaping Machine with universal table. Rebuilt to fine tolerances by highly skilled craftsmen. Seen London area.—BOX C559, MACHINERY, Clifton House, Euston Road, N.W.1.

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FINE MACHINE TOOLS *at*

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VICTORIA WORKS, LONDON, N.W.10
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Reed Prentice No. 6 Large Vertical Milling Machine. Table 84in. × 20in. 3¼in. tee slots. Table traverse long. 72in. Table traverse trans. 24in. Power feeds and rapid feeds, spindle speeds 15 to 500 r.p.m. Spindle traverse 12in., head traverse 24in. Throat clearance 28in., daylight max. 38in., min. 2in. Seen London area.—BOX C558, MACHINERY, Clifton House, Euston Road, N.W.1.

HIGH QUALITY USED MACHINE TOOLS

HERBERT No. 12 Heavy Duty Combination Turret Lathe. Full chucking equipment. 400/3/50.
TOWN 28in. Vertical Spindle Drilling Machine. Compound table. 400/3/50.
K. & W. 33in. Sensitive Radial Drilling Machine. Swing-aside table, swing-aside arm. 400/3/50.
JONES & SHIPMAN 20in. Vertical Drilling Machine. No. 4 Morse Taper. Power feed. 400/3/50.
KEARNS No. 2 Standard Horizontal Boring Machine with facing head and sliding spindle. 400/3/50.
SNOW T20 Table Surface Grinding Machine.
MILWAUKEE CVA 2E Plain Horizontal Milling Machine. Table size 54in. × 12in. Power and rapid traverses. 400/3/50.
ARCHDALE 28in. Horisontal Manufacturing Milling Machine, with power and rapid feeds. Table size 40in. × 30in. 400/3/50.
HULLER No. 5 Vertical Automatic Tapping Machine. Capacity 1½in. steel, 1¼in. brass. 400/3/50.

WE UNDERTAKE REBUILDING OF ALL TYPES OF MACHINE TOOLS

CENTAUR TOOL WORKS,
EYRE STREET, SPRING HILL,
BIRMINGHAM, 18.
Tel.: EDGbaston 1118 & 1119 'Grams: Capetan, Birmingham

Randalls
(LUTON) LIMITED

Selbourne Road Luton Tel. 52351

New Machines From Stock

MITCHELL DM. 8 Lathe.
WILLSON 7¼in. Newall Lathe.
BOXFORD Model 'A' Lathe on Cabinet Stand.
VICTORIA VI and V2 Vertical Mills.
DENBIGH D4 Miller.
VICTORIA U2 Universal Miller.
6in. and 8in. Hacksaws.
MYFORD MG. 12 Grinder.
RICHMOND SR.2 48in. Radial Drill.
EXCEL No. 1 Surface Grinder.

Used Machines Available include :

WARD 1A Capstan complete with equipment.
HERBERT OV Vertical Miller.

Classified Advertisements (*PLANT FOR SALE, contd.*)

WIDDOWSONS

PEARN-RICHARDS PRT2N Horizontal Boring and Facing Machine. 3in. Traversing spindle, chain drive to head, coolant fittings, 400/3/50. As New.
SONDERMANN & STIER 8ft. Double Column Heavy Duty Vertical Boring and Turning Mill, with side head, swing 104in. dia., admit 58in. high table to cross slide, 35 h.p. motor.
PENSOTTI KTV.1050 Turret Type Vertical Boring and Turning Mill, with side head, swing 43in. dia., table speeds 10 to 125 r.p.m.
WEBSTER & BENNETT 48in. Single Column Turret Type Vertical Boring and Turning Mill, to swing 104in. dia. Taper Turning Attachment, 35 h.p. motor.
ASQUITH OD.1 4ft. Radial Drilling Machine, No. 5 Morse Taper.
GORTON Model 3.U High Precision Two-dimensional Pantograph Engraving Machine, longitudinal feed 10in., vertical feed 9½in. max. Work table 8in. × 12in. Ratios 1 : 1 to 1 : 40. Useful quantity of copy in fitted wooden boxes.
REINECKER 10ft. Automatic Gear Shaping Machine. Face width 7in., max. pitch 1 d.p.
KLINGELNBERG HK.500B 20in. Capacity Gear Quenching Press.
NORTON Model "C" 14in. × 36in. Hydraulic Universal Cylindrical Grinding Machine. Excellent equipment including internal spindle.
CHURCHILL Model PBH 12in. × 36in. Hydraulic Universal Cylindrical Grinding Machine. Excellent equipment, including internal spindle, steadies, etc.
DO-ALL Horizontal Spindle Hydraulic Surface Grinding Machine, capacity 16in. × 6in., wheel 7in. × 1in.
SNOW Model T.20 Table Type Surface Grinding Machine, with extended table, dust extractor, etc. Three machines available. In excellent condition.
SWIFT 15½in. Centres Heavy Duty Gap Bed S.S. & S.C. Lathe, admit 10ft. 6in. between centres, taper turning attachment.
WARD No. 13 Combination Turret Lathe, covered bed, 25in. concentric chuck, 27in. 4-jaw independent chuck, good turret tooling, taper turning attachment. 35 h.p. motor, 400/3/50. Modern Machine. Excellent condition.
HERBERT No. 7A Combination Turret Lathe, covered priamatic bed, 15½in. swing, speeds 30 to 750 r.p.m. 400/3/50.
MINGANTI 20-40P Hydraulic Pre-Selector Bar Feed Capstan Lathe, 14½in. swing, 1⅝in. collet chuck, speeds 60 to 1,500 r.p.m. 400/3/50.
WARD No. 3A Chucking Capstan Lathe, 13in. swing, 1½in. hollow spindle, speeds 42 to 825 r.p.m. 400/3/50.
WARD No. 2A Bar Feed Capstan Lathe, 11in. swing, 1⅛in. hollow spindle, speeds 48 to 1,020 r.p.m. 400/3/50.
GORTON 9J Duplicating and Diesinking Machine. Table working surface 35in. × 10½in. Hand operated duplicator table.
CINCINNATI No. 4 Dial Type High-Speed Plain Horizontal Milling Machine, oversize table 86½in. × 16½in.
SOMUA FV.4B Vertical Milling Machine, table 75in. × 16in.
MILWAUKEE 3H Vertical Milling Machine. Table 75in. × 16in.

HERBERT
WIDDOWSON
& SONS LTD.
CANAL STREET, NOTTINGHAM
'Phone: 51891

AUTOS
CONOMATIC 1¼in. 8 spindle. Type W.W.
BORING
KEARNS No. 2 Boring and Facing.
DRILLING
ASQUITH 4ft. 6in. O.D.1 Radial Drill.
PROGRESS 5E. Round table.
GRINDING
LANDIS 12 × 48 Universal Grinder.
CHURCHILL 8 × 36in. Plain. Hydrauto bearings.
LATHES
WARNER & SWASEY No. 2A Long bed.
SOUTHBEND 16in.
EDGWICK 7in.
DEAN, SMITH & GRACE. Height of centres 7in.
WARNER & SWASEY No. 5 Preselector.
MILLING
20in. **ARCHDALE** Plain Mill. Rapid.
18in. **EDGWICK** Production Mill
MILWAUKEE 2E Plain.
SHAPING
24in. **CHURCHILL REDMAN** Heavy Duty.
19in. **TOWN** Heavy Duty.
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EDWARDS 6ft. × ⅛in. Overcrank.
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MORGAN 6ft. × 14g. Universal.
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EDWARDS 6ft. × 14g. Open ended.
EDWARDS 6ft. × 16g. Open ended.
"ELDAIR" NEW PRESS BRAKES
6ft. × 12g. between column. Delivery 10 weeks.
6ft. × ¼in. between column. Delivery 3 weeks.
10ft. × ¼in. between column. Delivery 1 week.
All machines motorised 400/3/50 cycles.

STANCROFT LTD.
BEDWORTH ROAD, COVENTRY.
Telephone: Coventry 88072/3.

Bryant No. 16C16 Hydraulic Internal Grinder complete with Hydraulic Wheel Dressing Device, Spindle, etc.
Further details from:—
C. & G. OLDFIELD LTD.
15 Abercorn Street
PAISLEY.

Bullard Vert. Auto. Type J—7in. double indexing—8 spindles.—C. DUGARD LTD., Denmark Villas, Hove 32471.

HELLER FV120 Vertical Hydraulic Milling M/c. Table 55in. by 15½in. Long, travel 43in. 30H.P. Main motor. Rapid and Power Trav. all directions. 18 speeds, 30/1,500 r.p.m. Excellent condition. £2,300.
BOX C.598, MACHINERY, Clifton House, Euston Road, N.W.1.

Lang Heavy Duty Boring and Facing Lathe, 14in. swing × 54in. between centres. Speeds 19 to 900 r.p.m. Feeds 36 to 432 c.p.i. Hole in spindle 1⅞in. dia. £200 ex works O.N.O. London area.—BOX C575, MACHINERY, Clifton House, Euston Road, N.W.1.

Worthington Simpson 2-stage Air Compressor. Air cooled, size 100. Brooks Motor 21-h.p. 400/440/3/50. Syn. speed 1,000 r.p.m. and Receiver.—BOX C587, MACHINERY, Clifton House, Euston Road, N.W.1.

Loewe Boring and Facing Lathe, high speed machine, 475 to 3,000 r.p.m. Swing 16in. Multi-speed motor, 400/3/50.—BOX C606, MACHINERY, Clifton House, Euston Road, N.W.1.

F. J. Edwards Ltd

GEAR CUTTING MACHINES
FELLOWS No. 61A and 645A Gear Cutters.
GLEASON 12in. Bevel Gear Cutters.
SYKES V10 Gear Generating Machine, 14in. external, 20in. internal capacity × 2½in. face.
CHURCHILL-CLEVELAND Model 120 RIGID HOBBER. Capacity 6in. dia. × 9in. face, 3 d.p.
GLEASON 12in. Straight Bevel Gear Generators.

GENERAL LATHES
OLDFIELD & SCHOFIELD 21in. centre Gap Bed Lathe; 7ft. between centres, 4½in. hollow spindle, 62in. swing in gap.
DEAN SMITH & GRACE 12in. centre, 18ft. bed Lathe, admit 12ft. between centres; 2½in. hollow spindle; swing 44in. × 15in. in gap.
OLDFIELD & SCHOFIELD 20½in. Centre Heavy Duty Gap Bed Lathe, swing 60in. in gap, 7ft. between centres.
BETTS-BRIDGEFORD 30in. swing × 22ft. Lathes, 16ft. between centres.
LANG 24in. Surfacing and Boring Lathe.
STANLEY 21in. Surfacing and Boring Lathe, swing 40in. × 12in. in gap.
STANLEY 8in. × 7ft. Gap Bed Lathe.
DENHAM 15½in. Centre Heavy Duty Gap Bed Lathe. Admit 10ft. between the centres, swing 50in. × 20in. in gap. 4½in. hollow spindle.
COLCHESTER TRIUMPH 7in. × 6ft. 6in. Gap Bed Lathe, 4ft. between centres.
WILLSON 7½in. × 6ft. Gap Bed Lathe, 3ft. between centres.
BERRY 8½in. × 8ft. Lathe, 4ft. between centres.
SOUTHBEND 7½in. × 5ft. Lathe, 2ft. between centres.
DEAN, SMITH & GRACE 6½in. Centre, 13Z Lathe.
LANG JUNIOR 6½in. × 6ft. Lathe, 30in. between centres.
CROMWELL 3½in. × 40in. Lathe, stepless speeds to 2,000 r.p.m.
LE BLOND 10in. Rapid Production Lathe, 7ft. between centres, 1⅛in. hollow spindle, speed 45-300 r.p.m.

CAPSTAN AND TURRET LATHES
WARNER & SWASEY 3A Turret Lathe; 23½in. swing; 4⅛in. hollow spindle.
WARNER & SWASEY 1A Turret Lathe; 16½in. swing; 3 5/16in. hollow spindle.
HERBERT No. 12 Combination Turret Lathe; roller bearing spindle; covered vee bed; swing over bed 23½in.; hollow spindle 6½in. dia.; good equipment. Chasing saddle with automatic sliding and surfacing feeds.
HERBERT No. 21 Combination Turret Lathe; swing 28in. over the bed; 7½in. hollow spindle chasing saddle with automatic sliding and surfacing feeds.
WARD No. 8 Combination Turret Lathe, covered bed, taper turning, chucking equipment. 1958 machine.
WARNER & SWASEY 1A Turret Lathe, 16in. dia. swing; 3 5/16in. hollow spindle.
HERBERT No. 7 Combination Turret Lathes, hollow spindle 2 3/16in. dia., 16in. swing; speeds 18-366 r.p.m.
WARD No. 7 Combination Turret Lathe, 14½in. swing, 2⅛in. hollow spindle, speeds 13-520 r.p.m., chasing saddle, ball chuck.
HERBERT No. 4BS Capstan Lathe, hollow spindle, dia. 2 3/16in., 13in. swing, speeds 30-511

SAWING MACHINES
NEW **KALTENBACH** Model HDM750 Hydraulic Circular Sawing Machines. 30in. dia. blade to cut 9in. dia. bar, 16in. × 6in. R.S.J. SOLE BRITISH AGENTS.
NEW **KALTENBACH** 14in. Blade Model KKS350 Universal Circular Sawing Machine, to cut steel and non-ferrous metals any angle from 0 deg. to 180 deg. Send for particulars of this unusually versatile machine. Demonstration gladly arranged. SOLE BRITISH AGENTS.

359-361, EUSTON RD., LONDON, N.W.1
Telephone: EUSTON 5000. Telex No. 24264.
And at Lansdowne House, 41, Water St., Birmingham, 3. *Telephone: Central 7606-8*

Classified Advertisements (*PLANT FOR SALE, contd.*)

RING BELLS for machine tools

LEEDS 63-7398

KEARNS OA Horizontal Borer. Build 1943. With top table 36in. square; 2½in. travelling spindle and 14in. dia. facing head. M.D. 400/3/50.

POLLARD Horizontal High Speed Drill, Type 15 H.F. Cap. ⅞in.

CHURCHILL No. 1 Planetary Grinder. Cap. with largest spindle 10in. dia. by 18in. long.

NEWALL Model L1 Internal Grinder. Swings 14in. dia. over bed. Hydraulic traverse 24in. and hydraulic plunge feed. Swivelling workhead. M.D. 400/3/50.

JONES & SHIPMAN 12in. by 36in. Plain Grinder. Wheels 14in. by 1½in. M.D. 400/3/50.

CINCINNATI 12in. by 48in. Hydraulic Universal Grinder. Filmatic bearings. Wheel 14in. by 1½in. Internal Grinding attachment. M.D. 400/3/50.

MOREY 2G Capstan. Swing over bed 14in. dia. Collet cap. 1in. With collet chuck; bar feed, etc. M.D. 400/3/50.

CROWTHORN 12in. S.S. & S.C. Lathe. Swings over straight V-bed 24in. Admits 5ft. 6in. between centres. Quick change gear box and taper turning. M.D. 400/3/50.

RICHMOND No. 01 Plain Horizontal Miller. Table 31in. by 8in. Table working surface 26in. by 8in. Long. traverse 16in. by hand or power; cross 5½in.; vertical 15½in. by hand only. Speeds 34-400 r.p.m. M.D. 400/3/50.

CINCINNATI 4/36 Duplex Hydromatic Miller. Table 54in. by 16in. Admits approx. 22in. between spindles. Speeds 20-159 r.p.m. by P.O. gears. Single cycle.

EDWARDS Punching Press Model APX. Tonnage rating 8. Variable stroke ¼in.-1¼in. M.D. 400/3/50.

MILWAUKEE 2K Vertical Miller. Table 56in. by 12in. 24 speeds 15-1,500 r.p.m. Power all ways including head. M.D. 400/3/50.

BESCO No. 21 Inclinable Power Press. Tonnage rating 40. Fixed stroke 3in. M.D. 400/3/50.

GEHA Saw Tooth Grinder. Cap. approx. 36in. Flat belt drive from 400/3/50 motor.

ALBA 10in. Crank Shaper. Swivelling table 10in. by 7½in. deep. M.D. 400/3/50.

HILMOR Type C1 Tube Bender. Non Mandrel Type. Hand operated for tubes up to 3in. dia.

CINCINNATI No. 5 H.P. Miller. Table 83in. by 21in. Long traverse 50in. 20 H.P. Motor 400/3/50.

FRITZ WERNER 810I Manufacturing. Miller. Table 35in. by 12in. approx. Speeds 45-2,240 r.p.m.

H. BELL (Machine Tools) LTD., Walter Street, LEEDS 4.

Kitchen & Wade H.4 Horizontal Drilling and Tapping Machine. Travelling Column Type with Square Indexing Table on Traversing Base.—Further details from:—

C. & G. OLDFIELD, LTD.,
15, Abercorn Street,
PAISLEY.

Tangye 3-Column 200-Tons Hydraulic Press for sale. Upstroke. Max stroke 15in. Max. daylight stroke down 20in. Diameter of ram 14in. Size of columns 5½in. diameter. Width between columns 21⅜in. With motor driven Tangye 3-plunger horizontal pump.—F. J. EDWARDS LIMITED, 359, Euston Road, London, N.W.1, or 41, Water Street, Birmingham, 3.

Harry Kirk

can recommend the following modern quality machines from STOCK

AUTOMATICS

BULLARD 8in. Mult-au-Matic, 6 spindles, type D.

RYDER Verticalanto, capacity 16in., swing × 8in., 6 spindles.

BORING MACHINES

RICHARDS 36in. Vertical Boring Mill, complete with side head.

JONES 6in. Spindle Horisontal Borer. Table 17ft. 6in. × 8ft. Spindle travel 48in. Rapid traverse 84in. per min. Motorised 400/3/50. Weight 70 tons.

SCHARMANN 3in. Sliding Spindle Horizontal Boring Machine, equipped with facing head and screwcutting.

BULLARD 36in. Vertical Boring Mill.

KITCHEN & WADE Vertical Fine Boring Machine, 14in. stroke. Compound table.

SCHIESS Vertical Boring Mill, 39in. dia. of table. Maximum swing 48in. S.C.M.D. 35 h.p., 400/3/50.

DRILLING MACHINES

POLLARD Model 3KX 3ft. Radial Drilling Machine.

GRINDING MACHINES

BROWN & SHARPE 6in. × 18in. Horizontal Spindle Surface Grinding Machine complete with magnetic Chuck and Dust Extractor.

PRECIMAX Universal Grinder, capacity 12in. × 72in.

HEALD No. 172 Gap Bed Internal Grinding Machine, maximum diameter of component 8in.

BILLETER Hydraulic Open-side Slideway Grinding Machine, capacity 47in. × 12in.

LATHES

NOBLE & LUND Heavy Duty Centre Lathe, 22in. centre height × 29ft. between centres. Max. swing over saddle 33in. dia.

HARVEY Heavy Duty Centre Lathe, 42½in. centre height × 52ft. between centres. Max. swing over saddles 65in. dia.

CHURCHILL-REDMAN S.S. & S.C. Centre Lathe, 7½in. centre height × 4ft. 6in. between centres.

DENHAM S.S. & S.C. Gap Bed Centre Lathe, 15½in. centre height × 12ft. 6in. between centres. Swing 54in. in gap, complete with Taper Turning Attachment, Faceplate, Chucks, etc.

CRAVEN S.S. & S.C. Centre Lathe, 13½in. centre height × 65ft. between centres.

CRAVEN S.S. & S.C. Centre Lathe, 13½in. centre height × 31ft. 6in. between centres.

WERMELINGER Centre Lathe, Model MJ8, 6in. centre height × 32in. between centres.

HERBERT No. 11 Combination Turret Lathe.

MILLING MACHINES

BROWN & SHARPE No. 3 Vertical Milling Machine.

ARCHDALE 30in. Vertical Milling Machine.

COLLET & ENGLEHARDT Keller Type Die Sinking Machine. Model FKf 80, capacity 60in. × 30in.

PLANING MACHINES

ORMEROD 24in. Heavy Duty Shaping Machine.

CLEVELAND Openside Planing Machine, capacity 10ft. × 2ft. 6in.

CINCINNATI Planing Machine, capacity 8ft. × 2ft. 6in.

MISCELLANEOUS MACHINES

BUTLER 18in. Stroke Slotting Machine.

SUNDERLAND No. 11 Gear Planer. Max. capacity 74in. dia. Max. stroke 9in. face. S.C.M.D. 400-440/3/50.

CLIFTON & BAIRD Cold Circular Saw.

Hydraulic Vertical Internal Honing Machine (manufactured by **PETER WOLTERS**). Capacity 0.2in. to 2in.

RAPIDAN Double Helical Gear Generating Machine, 12in. diameter capacity.

Further details from

HARRY KIRK ENGINEERING LTD.,
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'Phone:
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FELLOWS Gear Shaper, Type 645 A 3, for ext. and int. spur and helical gears. Max. ext. and int. pitch dia. 18in.; max. face width ext. and int. 3in.; max. diametrial pitch, spur, 3/4; max. diametrial pitch, helical, 5/7; max. helical angle 30in.; work spindle 5¼in.; working height max./min., 8½/4in.

SUNDERLAND No. 16 Gear Planer for spur and spiral gears, motor drive, fully equipped and ready for work, capacity 32in. dia. × 6in. face × 3 D.P.

HEIDENREICH & HARBECK 50KH Bevel Gear Generator, 2-tool type, for straight bevels, minimum/maximum pitch ratio 1 : 1—2in.-16in., minimum/maximum ratio 1 : 7.5—1⅞in.-22in., maximum length of cone 11¼in., maximum/minimum D.P. 2½/12½, h.p. motor 5.

SYKES No. 3C Horizontal Gear Generator for internal and external spur, helical and double helical gears, max. dia. 40in., max. face width 10in., max. pitch 2½/3.

RAPIDAN Heavy Duty Gear Generator, Size No. 4 extended. Motor drive. For internal and external spur gears. Capacity: internal gears 68in. dia., external gears 56in. dia. Face width 1in.-6in. max. Max. D.P. 2.

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90in. **MUIR** Gear Hobber. Type MT. 9 for spur, spiral, helical and worm gears. Capacity: for spur and worm gears max. dia. 90in. At high speeds 72in. For spiral gears at 10 deg. 90in., at 45 deg. 70in. Max. face width 30/26in. Max. D.P. 1¼. Dia. table 58in. Hob speeds from 18 to 80 r.p.m. H.p. main motor 12.

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Cashmores

Selections of Machine Tools from Stock or Early Delivery

DRILLING MACHINES

ASQUITH Model O.D.1 6ft. Heavy Duty Radial Drilling and Tapping Machine. Motorised 400/3/50 cycles, with loose box drilling table.

KITCHEN & WADE 4ft. All Electric Radial Drilling and Tapping Machine, with low base and loose box drilling table, spindle bored No. 4 M.T., spindle speeds 80/1,500 r.p.m., motorised 400/3/50 supply.

ASQUITH 5ft. 9in. Portable Universal Radial Drilling Machine, motorised 400/3/50 cycles.

BORING MACHINES

GRAHAM & NORMANTON Surfacing and Boring Lathe, with Norton type screwcutting gearbox, 42in. swing in gap, 18 spindle speeds 9/461. Motorised 400/3/50 cycles.

WEBSTER & BENNETT 36in. Vertical Boring Mill, with side head, motorised 400/3/50 cycles.

WEBSTER & BENNETT 48in. Single Column Type Vert. Boring Mill, mot. 400/3/50 cycles.

SLOTTING MACHINES

BUTLER 8in. stroke Production type Slotting Machine, 20in. dia. rotary table. Motorised 400/3/50 cycles.

BUTLER 14in. stroke Slotting Machine, with 30in. rotary table Motorised 400/3/50 cycles.

Unused **ORMEROD** 12in. Slotting Machine, dia. of table 27in., max. dia. of work admitted 48in., 9 cutting speeds 12/47ft. per min., motorised 400/3/50 supply.

PLANING MACHINES

STIRK 8ft. 0in. × 4ft. 6in. × 4ft. 6in. Double Column Type All Electric Planing Machine, 4 toolboxes.

LATHES

WARD No. 8 Covered Bed Combination Turret Lathe, arranged for chuck work, 16 spindle speeds 25-1,000 r.p.m., motorised 400/3/50 cycles supply.

LANG 15in. Centre Lathe, 2 saddles, admit 17ft. 6in. between centres, mot. 400/3/50 cy.

LANG 18in. Centre Lathe, one saddle, admit 10ft. 6in. between centres, mot. 400/3/50 cy.

MILLING MACHINES

CINCINNATI Model 34/60 Duplex Hydromatic Milling Machine, size of table 79in. × 18in., orgitudinal feed 60in., motorised 400/3/50 supply.

CINCINNATI Model 4/48 Plain Hydraulic Milling Machine, size of table 65in. × 16in., longitudinal table feed 48in., motorised 400/3/50 supply.

HERBERT No. 46V Vertical Milling Machine, with sliding head, working surface of table 58in. × 15in., longitudinal traverse of table 36in., 12 spindle speeds 25/500 r.p.m., motorised 400/3/50 supply.

CINCINNATI No. 3 Semi-Dial Type Vertical Milling Machine, working surface of table 50in. × 18in., spindle speeds 18/450. Motorised 400/3/50 cycles.

C.V.A. "Kearney & Trecker" model 2E Dial Type Horizontal Plain Milling Machine, working surface of table 41in. × 12in., longitudinal feed 29in., cross feed 12in., 8 spindle speeds 25/1,000 r.p.m., motorised 400/3/50 supply.

CINCINNATI Model 3/36 Hydromatic Milling Machine, table 54in. × 14in., motorised 400/3/50 cycles.

MANN Vertical Milling Machine, with swivel head, dial change to spindle speeds and feeds, table 46in. × 12in., 9 speeds 48/750 r.p.m., motorised 400/3/50 supply.

BROACHING MACHINE

CINCINNATI 10 ton Vert. Single Ram Hydraulic Surface Broaching Machine, 66in. stroke, 20in. × 20in. table, mot. 400/3/50 cycles.

GRINDING MACHINES

PRECIMAX Model MPL 6in. × 24in. Hydraulic Plain Cylindrical Grinding Machine. Hydraulic feed to table, motorised 400/3/50 supply.

SNOW Model V.A.12 Vertical Spindle Hydraulic Surface Grinder, table 33in. × 10in. Motorised 400/3/50 cycles.

NEWALL 10in. × 36in. Hydraulic Plain Grinder, motorised 400/3/50 cycles.

MISCELLANEOUS

ADAMSON 30 tons and **CLYDE** 10 tons Overhead Electric Travelling Cranes, 42ft. 3in. span.

JOHN CASHMORE LTD.

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FOSDICK Single Spindle Pedestal Drilling Machine.

FOSDICK 2-spindle Pedestal Drilling Machine.

FOOTBURT No. 26 Pedestal Drilling Machine.

HERBERT 2-spindle Pedestal Drilling Machine on a 3-spindle base.

MILWAUKEE Model "H" Horizontal Miller.

CINCINNATI No. 4 Horizontal Miller, dial feeds and speeds, 1,300 r.p.m.

CHURCHILL 10in. × 36in. Cylindrical Grinder.

HERBERT 4.S.E. Capstan Lathe.

WARNER & SWASEY No. 2 Capstan Lathe.

WARNER & SWASEY No. 6 Capstan Lathe.

WARD No. 10 Combination Turret Lathe, covered bed, 8-spindle speeds.

WARNER & SWASEY No. 5 Capstan Lathe.

HERBERT N.D. Centre Lathe, 8in. × 6ft. between centres.

WARD No. 7 Capstan Lathe, covered bed, arranged for chucking.

HERBERT 7A Combination Turret Lathe, covered bed.

LE BLOND Regal 6½in. Centre Lathe, Complete with taper turning attachment.

CINCINNATI Plain Hydraulic Cylindrical Grinder, model "ER." 10in. × 48in. Power-hand, servo infeed equipment, Filmatic bearings.

CINCINNATI Ditto, 10in. × 30in.

(Both practically unused—As brand new.)

THESE MACHINES CAN BE INSPECTED AT ANY NORMAL BUSINESS HOURS AT OUR STOKE-ON-TRENT BRANCH.

Edgwick Vertical Keyseating Machine. 4½in. stroke, throat 8½in., max. daylight 15in. to 3in. Table 32in. × 9in. 5½in. cross slide traverse, 16in. table traverse, 6 spindle speeds, collet holders and collets. 1½ h.p. motor, 400-440/3/50. 690-1,440 r.p.m. Switchgear complete.—BOX C561, MACHINERY, Clifton House, Euston Road, N.W.1.

Churchill-Redman 12in. × 40in. Semi-Automatic Hydraulic Profiling Lathe. Hydraulic chuck and tailstock. Front profiling slide, rear facing slide, 15 h.p., two-speed motor. Post-war machine. Excellent condition. —LEE & HUNT, LTD., Crocus Street, Nottingham. Tel.: 84246.

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SONDERMAN & STEIR 40in. Vertical Boring Machine. Pentagon turret. 15 table speeds to 135 r.p.m. M/D 400/3/50.

DENHAM 6½in. × 6ft. B.C. A.G.H. Centre Lathe. M/D 400/3/50.

MASCOT 8½in. × 6ft 6in. B.C. A.G.H. Centre Lathe. M/D 400/3/50.

DICKINSON Horizontal Borer. 2½in. travelling spindle. Table 44in. × 28in. M/D 400/3/50.

PARKSON 2T Universal Milling Machine. Table 48in. × 10in. M/D 400/3/50. Vertical head.

MURAD 1B 1in. Capstan Lathe. M/D 400/3/50.

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TAYLOR & CHALLEN Size No. 3½ G.D.P. Double Sided Geared Double Action Cam Action Drawing Press. Motorised for 400-440/3/50 supply. Spring balanced blankholder. Punch stroke 2in. Blankholder stroke 5in. Between uprights 22in. Bed 20in. × 18in. Hole in bed 9½in. diameter. Weight approx. 55 cwt.

BESCO Type EB2 Eccentric Power Punching Press. Motorised for 400/3/50 supply. Max. pressure 18½ tons. Stroke adjustable from ⅜in. to 1½in. Depth of throat 7in. Table 19½in. × 15in. Hole in table 7½in. × 6in. Weight approx. 15½ cwt.

TWO NEW **LEN40/250** Open Fronted Inclinable Power Presses. With adjustable stroke. Motorised for 400-440/3/50 supply. Pressure exerted 40 tons. Depth of throat 9½in. Adjustment of stroke ⅛in. to 3⅛in. Table 18½in. by 25⅝in. Hole in table 8½in. diameter. Weight approx. 58 cwt.

TWO NEW **LEN25/220** High Speed Open Fronted Inclinable Power Presses. With adjustable stroke. Motorised for 400-440/3/50 supply. Pressure exerted 25 tons. Depth of throat 8⅜in. Table 16½in. × 22⅛in. Hole in table 8½in. Stroke adjustable from ⅛in. to 3⅛in. Weight approx. 35 cwt.

HORDERN MASON & EDWARDS Type RFT.23½ Double Sided Double Action Toggle Drawing Press. With ejector and automatic safety guard. Between uprights 23½in. Tee slotted table 21in. × 26½in. Hole in table 14in. diameter. Weight approx. 135 cwt.

BLISS No. 6M Geared Inclinable Power Press. Motorised for 400-440/3/50 supply. Pressure exerted approx. 60 tons. Stroke adjustable from 2in. to 5in. Opening through back 16in. Bed 32½in × 22in. Hole in bed 17½in. × 12½in. Continuous or non-repeat operation. Weight approx. 95 cwt.

BLISS No. 19 size Inclinable Power Press with single R. to L. roll feed. Pressure exerted approx. 14 tons. Stroke ⅜in. Bed 17in. × 9½in. Hole in bed 9in. × 5in. Width of feed rollers 4in. Length of feed variable from 0 to 2½in. Weight approx. 13 cwt.

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Norton 60in. × 12in. Horizontal Surface Grinder, 400/3/50.—A. McNAMARA & CO., LTD., New Line, Bacup, Lancs. 'Phone: Bacup 946.

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MINGANTI 20/40P 1 9/16 cap. Bar feed.
GISHOLT IL Turret.
DRILLS
CORONA No. 21 AR No. 3 M.T.
ARCHDALE 28in. Prod. Four speeds.
CORONA 36in. Radial 12N.
CORONA 15AX 1¼ capacity.
JONES & SHIPMAN 816, ⅞in. cap.
CORONA 1AX No. 1 Morse Taper.
CORONA 15 HF, ⅞in. cap.
PEGARD 3ft. 6in. Radial.
LELAND GIFFORD 2-sp., No. 2 M.T.
HERBERT Type B. Single Spindle, ½in.
STEINEL Cluster Type.
CORONA 6MX Cluster Type.
HERBERT Type H, ½in. cap.
ARCHDALE 21in. Production.
CORONA 12AX, ⅞in. cap.
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LIENHARD No. 1H and 2.
T.T. & H. 3DS Three Dimensional.
HUPFIELD Router.
T.T. & H. Type C, C.B. and M.A.
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WICKSTEAD No. 1 Hacksaw.
RAPIDOR 6in. Hacksaw.
RAPIDOR Filing.
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MAXICUT 7in. × 2in. × 6 D.P.
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CHURCHILL OSB 8in. × 30in.
EXCEL No. 2 14 × 6 hand.
LUMSDEN Vert. 210 XXM.
SNOW Table 20in.
ABRASIVE No. 34 Vertical Spindle.
ABRASIVE 3B, 24in. × 8in.
ABRASIVE No. 1½in. hand.

GRINDERS (Internal)
BRYANT 16/38.
NEWALL Model KN.
GRINDERS (Cylindrical)
NEWALL 10 × 24 hyd.
COVENTRY GAUGE 6in. × 12in.
CHURCHILL 7 × 36in.
CHURCHILL PBH 12 × 36in. Uni.
NEWALL 6 × 18.
FRANCIS 6 × 7.
PRECIMAX MPB 10 × 48.
GRINDERS (Miscellaneous)
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J. & S. Drill, ¼ to ⅞.
STEDALL WUNDERLI Carbide.
TAUCO 10in. Abrasive Cut off.
ROWLAND 12in. × 2in. Single Wheel.
ABWOOD Carbide.
WICKMAN NIVEN Carbide.
WADKIN Saw Sharpener.
TURNER T. & C.
JACKMAN D/E 18in. Disc.
EXCEL Model OS, T. & C.
TURNER 14/20 20in. × 3½in. wheels C/E.
MATRIX No. 10 × 10in. Plain Thread.
NEWALL 420 Univ. Thread for taps.
HUNT No. 0 and 1 Tap Regrinders.
HUNT No. 0 and 2 Drill.
KEYSEATERS
BENTLEY 5in.
ASQUITH H.K.O. Horiz. Duplex.
EDGWICK 4in.
LATHES
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SMART & BROWN Model M.SS and S.C.
HARRISON 4½in. S.S. & S.C.
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SWIFT 12 SV5, facing and boring.
PRATT & WHITNEY 12in. × 30in. S.S. & S.C.
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SMALLPIECE 12in. × 20in. Multi-tool.
LORCH A11 Precision.
DENHAM 5in. S.S. & S.C.
RIVETT 3½in. Plain. Model 715.
WARD, HAGGAS & SMITH 8½in. × 78in.
COULTHURST Surfacing and Boring.
RYDERMATIC No. 12 Multi Tool.
MARKING MACHINE
FUNDITOR "Sand Jet".

MILLERS (Horizontal)
DENBIGH Type C4.
ROSCHER EICHLER, Table 39in. × 12in.
SUNDSTRAND No. 0 Production.
PALLAS LM, Table 30in. × 7in.
ST. ANDREA Model UFO3.
ADCOCK & SHIPLEY Model OCD.
KENT OWEN 1/8 and 1/14 Production.
HARDINGE Precision.
WERNER. Table 14 × 5.
JONES 225 Univ. Table 22 × 6.
ARCHDALE 28in. and 20in.
MILLERS (Vertical)
C.V.A. 79 Tool and Die.
PALLAS VI. Table 30 × 8½.
REED PRENTICE No. 5, 68in. × 16in. table.
MILNE. Table 30in. × 8in.
WADKIN Type LXIA. Table 36in. × 13in.
PRESSES (Hand)
STANELCO Toggle.
APEX Treadle.
NORTON No. 4.
PRESSES (Power)
LECRA No. 8. 4 tons.
GERMAN Rotary Punch.
WRIGHT Clicking Press.
SCHULER VZZ, 15 tons d/s gripper feed.
PROFILING MACHINE
CURDNUBE 2 Spindle. Model KIV.
RIVETERS
HIGH SPEED Hammer, 7/16 cap.
TURNER RH 18 (½in.) RH38 (⅝in.) RH34 (½in.).
TURNER RH 14/12 (¼in.) RS6 (⅝in.).
SCREWING MACHINE
ATLAS No. 2, 3in.-6in. (Unused.)
SHAPERS
INVICTA 24in.
NEWEY 14in.
SLOTTERS
EDGWICK
BENTLEY 4in.
TAPPERS
ESSEX No. 124, ½in. cap and No. 24.
THIEL No. 4, ¼-9/32nds.
ACE Horiz., ½in. capacity.
HASKINS Type 3 C.A.M., ½in. cap.
J & S Electrocap, ½in.
THREAD MILLERS
JONES FBI 4ft. between centres.

Willson 8½in. Lathe, 6ft. 0in. between Centres, new 1953. Complete Equipment, Motor, etc.
Further details from:—
C. & G. OLDFIELD, LTD.,
15, Abercorn Street,
PAISLEY.

Norton Universal Grinding Machine. 1942. Size 12in. × 36in. Condition good. External/internal equipment.—BOX C679, MACHINERY, Clifton House, Euston Road, N.W.1.

Ormerod 16in. Double Headed Heavy Duty High Speed Shaper, length of stroke 16in., length of bed 10ft. 0in., width of bed 1ft. 9in., depth of bed 2ft. 10in., feed of toolbox 6in., max. section of tools in toolholder 1¼in. × 1¼in., traverse of each headstock 5ft 0in., 12 feeds to headstock 0.01in. to 120in., max. distance between tools 6ft. 6in., min. 1ft. 6in., two tables supplied, 9 speeds to ram, ram strokes per min. 11 to 120, 1952 machine, almost new condition.

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EARLY DELIVERY

MITCHELL OF KEIGHLEY 8¼in. Type DM8 Gap Bed Lathe, by 5ft. 3in. B.C. 400-440/3/50. January, 1961 delivery.
MITCHELL OF KEIGHLEY 10¼in. Type DM10 Gap Bed Lathe by 5ft. 5in. between centres. 400-440/3/50. December delivery.
MITCHELL OF KEIGHLEY 12¼in. Type DM12 Gap Bed Lathe by 6ft. 9in. B.C. 400-440/3/50. April delivery.
VICTORIA No. 2 Rapidmil Universal Milling Machine, table size 48in. × 11¼in. 400-440/3/50. December delivery.
VICTORIA No. V2 Vertical Milling Machine. Table size 45in. × 11in. 400-440/3/50. Instant delivery.

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ASQUITH Two-Spindle Profile Milling Machine, independent motor drive to each spindle, 415/3/50, table W.S. 18in. × 15in. Range of speeds 250 to 3,000 r.p.m.
TRIDENT Model V.O. Swivel Head Vertical Milling Machine, 415/3/50. Table W.S. 30in. × 8in.

R. O. Gray.

4/6, Minerva Road, Park Royal,
London, N.W.10
Telephone: ELGar 4841/4842

No. 16 Herbert Vertical Milling Machine. Table 55in. × 13¼in. Long traverse 34in. 16 speeds 16-427 r.p.m. B.C. motor.

No. 2 Edgwick Vertical Milling Machine, with power operated rotary table. Table 46in. × 11in., long. traverse 26in. Spindle bored No. 40 S.M.T., 5 h.p. 400/3/50 motor, 9 speeds 37-605 r.p.m.—LEE & HUNT, LTD., Crocus Street, Nottingham. Tel.: 84246.

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VOA Jig Borer, 20in. × 15in. Table Movement.
BUTLER 4ft. Double Column Vertical Borer, motor drive, speeds to 44 r.p.m.
SELLARS 5in. Horizontal Boring Machine, cross traverse of table 60in.

GRINDERS

NOVAMATIC "A" Internal Grinder.
LANDIS Plain Cylindrical Grinder, 6in. × 18in.
HORSTMAN Thread Grinder, capacity 5in. dia. × 9in. b.c.

LATHES, CAPSTANS AND AUTOMATICS

BROADBENT 12½in. Centre × 72in. b.c., swings 42in., 4½in. hollow spindle, speeds 11-375, 12½ h.p. motor. Timken roller bearing headstock.
HERBERT No. 20 Comb., spindle bore 7in., speeds 5-201.
WILSON 7½in. Centre Lathe.
ROLLO 6½in. Centre Lathe.
Two **CLEVELAND** ⅞in. Model A Single Spindle Autos.
BOYES & EMMS S.S. & S.C. Lathe, centre height 16in. × 7ft. 6in.
HERBERT No. 9 Combination Turret Lathe.
CHURCHILL-REDMAN Gap Bed Surfacing and Boring Lathe, centre height 12in., distance spindle to turret 55in. Swing in gap 40in.
SWIFT Hydraulic Copying Lathe, 36in. swing × 5ft. 6in. b.c., 30 h.p. drive.

MILLERS

ARCHDALE 28ip. Horizontal Miller.
VICTORIA UI Universal Miller, with vertical attachment.
BROWN & SHARPE No. 2 Vertical Mill, table 54in. × 14in., speeds 30-1,200 r.p.m. Power down feed to head.
HURTH Single Head Keyseater, table 26in. × 9in.
SCHIESS DEFRIES Vertical Keyseater.

PRESSES

30 ton **RASKIN** Double Sided Double Geared Drawing Press. Area 20in. × 23in. Draw 4½in.

SLOTTERS, SHAPERS AND PLANERS

PENSOTTI PK90 Opensided Planer. Capacity 8ft. × 3ft. 6in. × 2ft. 6in. Complete with milling head.
NEWEY 14in. Shaper.
MAXICUT High Speed Gear Shaper, max. dia. 7in. × 2in. face.
NEW **POREBA** Model HDA80 Planer, capacity 10ft. × 32in. × 30in. table, drive by Heid gearbox.

MISCELLANEOUS

MORGAN 4ft. × ½ Overcrank Guillotine.
CIRCULAR Graduating Machine for English, metric and degree graduations.

Visitors always welcome

GATE MACHINERY Co. LTD.
176/178, Victoria Road, Acton,
LONDON, W.3. ACOrn 6881

DIMCO

No. 7 **WARD** Bar Feed Capstan Lathe. Covered bed. Speeds 50-1,000 r.p.m. 6 years old. Motorised 400/3/50.
No. 2 **WARNER & SWASEY** Chucking Capstan.
No. 3 **GISHOLT** Chucking Capstan, some bar Feed equipment.
2D **HERBERT** Bar Feed Capstan Lathe.
2S. **HERBERT** Bar Feed Capstan Lathe.
2SS. **HERBERT** Bar Feed Capstan Lathe.
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ASQUITH Horizontal Floor Boring Machine, 7in. diameter travelling spindle.
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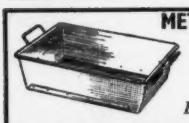

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One Catalogue will admit two persons on the View days and one person on the Sale days.

The Secretary of State for War reserves the right to refuse admission.

SITUATIONS VACANT

If you do not wish your reply to any Box No. advertisement in this section to be forwarded to certain firms, please advise us. Your reply will then be destroyed but you will not be notified as this would disclose the identity of the advertiser.

Planner Required by Mechanical Engineers. Practical Machine Shop experience essential.—Apply CHAMBERLAIN INDUSTRIES, LTD., Argall Avenue, Leyton, E.10, or 'phone Mr. Page, LEY 3678.

Senior Machine Tool Designer required to be directly responsible to the Managing Director for the design of a new range of Machine Tools. Age 30-45 and in possession of at least H.N.C.

Apply giving full particulars of age, education, apprenticeship, experience and present salary to INDUSTRIAL TECHNICS (SOUTHAMPTON), LTD., Empress Road, Southampton.

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Apply giving details of age, experience and salary required, to:

Personnel Manager,
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Temple Manor Works,
Strood, Rochester,
Kent.

Classified Advertisements (*SITUATIONS VACANT, contd.*)

Draughtsman Detailer for Small precision press tools. Candidates are required between the ages of 20/24 years for detailing high precision power press and multi-slide press tools. They will be working under an experienced designer at an attractive salary with a company which is rapidly growing and is in the main producing large quantities of high precision pressings for the electronics industry. Modern methods of production and design are in operation. Preference will be given to those who have obtained their H.N.C. and who have had similar experience.—Applications to C. BRANDAUER & CO., LTD., 401, New John Street West, Birmingham 19. Tel.: Aston Cross 3818.

Highly Paid, Secure and Interesting posts are always available for technically trained men. Find out how you can put some letters after your name by preparing at home on "No Pass—No Fee" terms. A.M.I.Mech.E., A.M.I.Prod.E., A.M.S.E., City and Guilds, etc., etc. Full details of exams and hundreds of courses in all branches of Engineering., Draughtsmanship, Management and Automation Techniques, the benefits of our Employment Dept., and unique record of 95 per cent successes are given in "Engineering Opportunities"—a valuable 148-page Guide which will reveal many chances you are now missing.—Write for your copy today (stating subject of interest).—FREE and without obligation, B.I.E.T. (Dept. 48a), 29, Wright's Lane, London, W.8.

Inspector Required by Mechanical Engineers. Must be fully experienced on inspection of hydraulic equipment. This is an additional Staff Appointment.—Apply CHAMBERLAIN INDUSTRIES, LTD., Argall Avenue, Leyton, E.10, or 'phone Mr. Clover, LEY 3678.

Press Tool Designer/Draughtsmen for advanced progression tools. London Trade Toolmakers. Salary, £900 per year.—BOX C574, MACHINERY, Clifton House, Euston Road, N.W.1.

Machine Tool Sales Engineer and Correspondent required.—Please write stating age, experience and salary required, to the MANAGER, BUCK & HICKMAN LTD., Otterspool Way, Watford By Pass, Watford, Herts.

Technical Correspondent Required to deal with correspondence and quotations in connection with sales of Machine Tools. Necessary qualifications to include some Machine Tool background and commercial experience. Applicant should be prepared to use initiative and take responsibility.—Apply: ELGAR MACHINE TOOL CO., LTD., 172-178, Victoria Road, London, W.3.

Experienced Storekeeper Required by Engineering Company in South East England, to take control of Parts and Material Stores. Candidates aged 28-40 years should have had a good training in Stores Procedures and at least 3 years' experience in a similar capacity. Good salary, contributory pension scheme, scope for advancement.—Apply in confidence giving full details of training, experience and salary required to BOX C588, MACHINERY, Clifton House, Euston Road, N.W.1.

Toolroom Superintendent Required. The Shop is mainly engaged in building of Light Special Purpose Machines similar to packaging machines. Applicant must have a good appreciation of mechanisms and be experienced in planning efficient boring, milling, etc., of small machine components. He must have served an apprenticeship and be aged between 32 and 45 years. Housing available. Pension and Life Insurance benefit.—Write STABILITY RADIO COMPONENTS, LTD., Cranes Farm Road, Basildon, Essex.

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The George Cohen 600 Group Limited have a vacancy for an Assistant Chief Designer with specialist experience of Milling and Radial Drilling Machines.

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An attractive salary will be offered.

Write, giving details of age, experience and qualifications to the Personnel Manager, Wood Lane, London, W.12.

Technical Correspondent Required by progressive and expanding Machine Tool Company. Post involves corresponding with customers and internal technical liaison work. Experienced man preferred but consideration would be given to a technical man interested in this type of work.—Apply GEORGE KINGSBURY & CO. (MACHINE TOOLS), LTD., 54, Victoria Street, S.W.1. 'Phone: Tate Gallery 0462.

Production Manager Required for small but rapidly expanding Precision Engineering business London, N.W.10 area. Engaged in manufacture of Packaging Machinery and some subcontract work. Good salary and excellent prospects for man, preferably qualified, able to plan and control batch production at lowest possible costs.—Full particulars to BOX C609, MACHINERY, Clifton House, Euston Road, N.W.1.

Works Manager for Small General Engineers in North London. Applicant must have had practical experience in the complete running of a small works with full control. Customer Liaison and Estimating, state salary required and when free.—BOX C603, MACHINERY, Clifton House, Euston Road, N.W.1.

KENT EDUCATION COMMITTEE

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Applications Are Invited From men holding one of the following qualifications:—

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Higher National Certificate or any Full Technological Certificate of the City and Guilds of London Institute, together with five years' industrial experience, or

Diploma in Technology.

Basic salary scale £520 × £27 10s. 0d.—£1,000. In fixing the commencing salary recognised war service or national service counts for increments and some allowance may also be made for industrial experience other than that mentioned above.

Further particulars may be obtained from the COUNTY EDUCATION OFFICER (reference T), Springfield, Maidstone.

A long established Company in West London employing over 1,000 people requires—

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for the design and development of new and existing machines. Although the work will be mainly related to the manufacture of polishes and tin boxes, experience in these fields is not essential. The most important qualifications for the vacancies are sound experience in engineering and in the design of mechanisms, and the ability to work with minimum supervision. H.N.C. is desirable but experience would be taken into account.

The positions are at staff level, they are permanent, there is a pension fund, also good social facilities, and the salaries envisaged are intended to attract top level men.

Written applications with full particulars should be made direct to the Chief Engineer, Chiswick Products Ltd., Burlington Lane, Chiswick, London, W.4.

Draughtsman Required for Detail work in connection with special purpose machine design. Good mechanical experience necessary.—DATIM MACHINE TOOL CO., LTD., Brooker Road, Waltham Abbey.

STEIN ATKINSON VICKERS HYDRAULICS, LTD.,

have the following vacancies at their Knightsbridge, London, Office:

SENIOR APPLICATIONS ENGINEER to take charge of the technical sales activities of the Machinery Division involving oil hydraulic circuitry and tendering for the Machine Tool, Diecasting and Plastic Moulding industries.

APPLICATIONS ENGINEERS for the above Machinery Division and also for the Plant Division involving oil hydraulic circuitry and tendering for the steel and heavy engineering industries.

Write, stating age and details of experience, to the Sales Manager, Stein Atkinson Vickers Hydraulics, Ltd., 197, Knightsbridge, London, S.W.7.

Royal National Institute for the Blind.

HETHERSETT Vocational Guidance Centre for Blind Adolescents, near Reigate, Surrey.

LIGHT ENGINEERING INSTRUCTOR required for September, 1961, or earlier. Applicants should possess O.N.C. or C. & G. Cert. (Mechanical Engineering) or equivalent, with good experience in industry.

The Centre gives vocational guidance, further education and social training to 25 blind boys and girls (aged 16-18 years). The Instructor is required to introduce them in small groups to the usual machine operations and Light Engineering type of work and must also take an active part in the life of the Centre.

Premises are being extended to accommodate 35 students with considerable development of the Light Engineering workshop. The successful applicant must therefore be available for consultation with the present Instructor during the summer term.

The Instructor can be resident or non-resident, but resident duties are required in either case. Salary on scale according to qualifications and experience with appropriate Superannuation and full emoluments if resident.

Application forms from SECRETARY-GENERAL, R.N.I.B. (Ref. EO), 224-8, Great Portland Street, London, W.1, for return within three weeks of advertisement.

REPRESENTATIVES

ROCKWELL MACHINE TOOL COMPANY LIMITED

Have a vacancy at their Midland Office for an

OUTSIDE SALES ENGINEER

to handle high grade British and imported Machine Tools. Applicants should have some engineering background, good knowledge of Machine Tools and preferably experience of working in the Birmingham, Wolverhampton and Black Country areas.

Reply stating age, experience and salary required.
To:—

1/5 Cateswell Road,
Hall Green,
BIRMINGHAM, 28.
Telephone: Springfield 1134/5

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Required by progressive Company handling a first class range of specialised machine tools.

Applicants should have a comprehensive knowledge of machine tools and a good technical background; must be resident in the Central Midlands.

The position carries an excellent basic salary, commission and expenses, and a car can be provided. Please send full details, which will be treated in strictest confidence to:—

BOX C.592, MACHINERY,
Clifton House, Euston Road, N.W.1.

Tungsten Carbide Technical Representatives required for London, Bristol and South Wales Areas. Toolsetting or Machining experience an asset. Salary, Commission and Expenses, Car provided.—Reply to BOX C595, MACHINERY, Clifton House, Euston Road, N.W.1.

SITUATIONS WANTED

Executive Engineer (36) Desires change, good organiser, administrator, etc. Indentured toolmaker, plus 4 years workshop, 5 years mechanical, jig and tool design, planning, estimating, production engineering. Qualifications H.N.C. Five years Technical Manager. Present location South Coast.—BOX C539, MACHINERY, Clifton House, Euston Road, N.W.1.

Factory Manager, 15 Years' executive experience, sound practical engineer, conversant with all aspects of Office and Works administration, customer liaison, Buying, Estimating, Planning, Production Engineering; used to full responsibility, seeks interesting appointment with progressive Company.—BOX C491, MACHINERY, Clifton House, Euston Road, N.W.1.

Works Manager, Age 41, Seeks position of interest and responsibility. 26 years' light engineering experience in all departments. Expert on automatics.—BOX C584, MACHINERY, Clifton House, Euston Road, N.W.1.

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Designer Seeks Change, Many years' experience machine design, experimental, special purpose machinery, food industry, machine tools, printing, etc. London area. —BOX C601, MACHINERY, Clifton House, Euston Road, N.W.1.

REPRESENTATIVES

Engineer, Age 39 Years, Leaving for Canada. Experience, Commercial Eng. Aircraft, Glass Re-Inforced Plastics, is keen to represent firm or firms interested in expansion of products. Interview would be welcomed before end of March.—BOX C605, MACHINERY, Clifton House, Euston Road, N.W.1.

Freelance Technical Representative calling industry London and Home Counties requires Agency for Tool Steels, H.S.S. Tools. Good quality essential. Part connection preferred.—BOX C 602, MACHINERY, Clifton House, Euston Road, N.W.1.

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Personal service guaranteed.
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Advertisers Are Desirous of acquiring a small or medium sized profitable engineering business in North or West London area, with continuity of management and some surplus capacity.—Full particulars to BOX C610, MACHINERY, Clifton House, Euston Road, N.W.1.

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WANTED
New or not more than Three Years Old RS2 Pfauter Hobber
Max. dia. 42in. Spurs, wormwheels with crossfeed head.
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INDEX TO ADVERTISERS—*(continued from page 165)*

When answering advertisements kindly mention MACHINERY.

B·S·A

5M **Maximum swing 7¾". Swing over cross slides 6⅛". Independent motors for spindle drive and rapid motion to turret and cross slides. Wide range of speeds with three automatic changes. Suitable for small batch work.**

95 **Maximum swing 12½". Swing over cross slides 10¼". Wide range of speeds and feeds. Three automatic speed changes. Headstock adjustable 4¾" longitudinally. *FIVE* face turret; adjustable 2" along the bed.**

Air chucking (from the range of additional equipment) increases their efficiency. The 95 machine can be supplied for fully electrical control.

	5M ins	5M mm	95 ins	95 mm
Maximum swing	7¾	197	12½	317.5
Maximum swing over cross slides	6⅛	168	10¼	273
Cross slides stroke	2¾	70	4	101.6
Cutting travel of turret	4⅜	111	5¾	146
Number and range of spindle speeds	21 FORWARD 14 REVERSE 58 to 1458 r.p.m.		30 40 to 834 r.p.m. or 60 to 1220 r.p.m.	
Horse power of main motor	4½		10	

445

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